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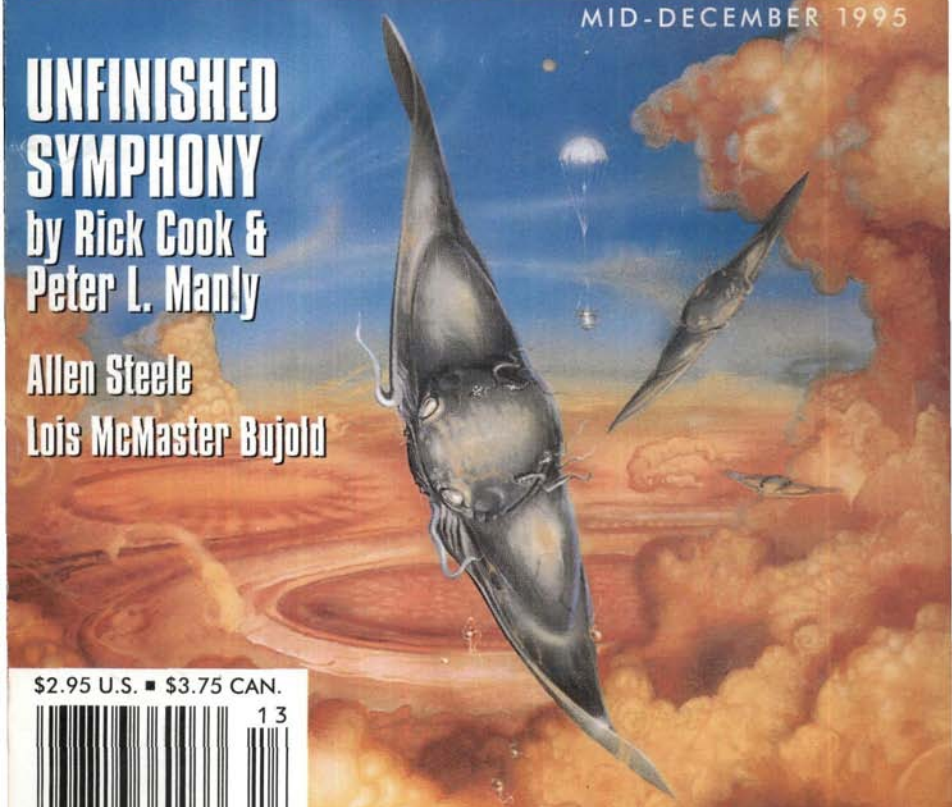

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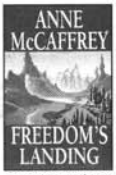

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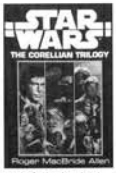

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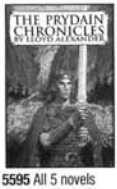

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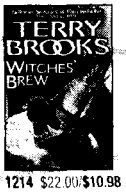

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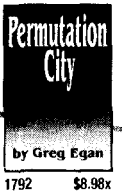

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EDITORIAL Stanley Schmidt

NOW YOU SEE IT . . .

Over the years I've heard many Humanities types say with faintly concealed scorn that they wouldn't want to work in science or technology because it's "so cut and dried." To those who *have* worked with science or technology, such a remark merely reveals that the speaker has never tried to do any—or didn't understand what was going on.

Consider, for example, this business of reproducibility. Scientists like to explain to outsiders that the very essence of scientific method is that experiments must be reproducible. That is, if you do an experiment today and repeat it tomorrow, you should get the same results. And if Scientist A tells Scientists B and C what she did, they should be able to repeat it with the same results.

What they don't tell laymen is how much work, frustration, insomnia, profanity, and exasperated violence against apparatus goes into getting that reproducibility.

Real-life equipment, you see, lives in the real world and doesn't behave nearly as simply or consistently as idealized theoretical models. Laymen know this, of course; it just doesn't occur to them that it applies to professional scientists, too.

You've had the experience. You've undoubtedly had at least one car that did something strange, irritating, potentially dangerous, and therefore scary—*except* when you tried to demonstrate the problem to the family mechanic. If it hasn't happened with a car, you've surely experienced it with something else. Such intermittent problems are, in the real world, exceedingly common. My direct inspiration for writing this was a recent rash of them: one car that wouldn't start at unpredictable times (usually when it was really important that it should), another whose transmission does odd things at odd intervals, a tape deck that occasionally takes a brief vacation from sending any output signal to one channel of the amplifier. . . .

In fact, I'm saving my work even oftener than usual as I write this, because lately my computer monitor has taken to occasionally going blank without warning. Nothing else seems to be affected; if the computer is working on something it can do without supervision, it goes right on doing it. If and when the display decides to

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come back, the result may be waiting. It will even respond to the relatively few instructions I can give solely with the keyboard and without knowing where the cursor is. But there's very little I can do when I can't see what the screen is supposed to be showing.

Why haven't I fixed these things, or had someone else do so? Quite simply, because they haven't yet become bad enough to make work impossible, or repair possible. I can do useful work on the computer until the display conks out, which (so far) it doesn't do all that often. And since it doesn't do it often or predictably, there's a very good chance that anyone trying to fix it would never actually see it happen and be able to directly identify what was causing it. The best he could do would be to listen to my description of the problem, list all the possible causes, and start changing everything that could possibly be responsible.

That could be a loose connection inside the CRT, in the high voltage power supply, or in any of the wiring associated with those things. If he changes possible culprits one at a time, I can never be sure he's fixed the computer—though I can be reasonably sure he *hasn't* if it dies again a week after I get it home. In that case, I have to take it back and try again. It doesn't take many trials and errors before the repair bills exceed the cost of a new and better computer. If he replaces all the possibly offending components at once, I may get the old computer working reliably again, but it instantly costs more than replacing and upgrading.

Therefore the least imprudent course, in the absence of unlimited funds, is to live with the problem while it's possible, half hoping it won't happen too often, and half hoping it will go out completely and permanently. Then, at least, whoever attempts the repair will be able to see what's wrong, what's causing it, and whether it's worth fixing.

Intermittent faults are every bit as exasperating for the repairman as for the user. If you're fixing things for a living, you don't want to have to keep doing the same job over and over while new ones pile up—and your reputation for getting the job done Right the First Time slips slowly away. Besides, it's just plain frustrating to have to guess, guess, and guess again. I know because I've done quite a bit of my own repair work (particularly

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in periods when time was easier to come by than money). Books and magazines give troubleshooting guides with charts of common problems and their solutions, but it often seems to me that such "common" problems are actually rarer than the quirky "now you see it, now you don't" type.

The kinds of people who think science is too cut and dried might be tempted by that observation to move to the other extreme. Maybe, they might say, there is no natural law. Things behave inconsistently and unpredictably because there are no principles that let you predict what will happen in a known set of circumstances. But such is not (as far as we know!) the case, at least at the macroscopic level. (At the quantum level, of course, things get more complicated.) All the failure modes, even the intermittents, follow the same physical laws as anything else. The problem is that real circumstances include so many factors that we don't know what they all are. A troubleshooting guide to common problems of radios, for example, can't take into account all the slipups that might have occurred in assembly or shipping, the effects of dust drifting in through ventilation holes, and abuse by curious three-year-olds.

There's an interesting recent development that shows promise for making intermittents easier to diagnose. In the last few years, computers have become so tiny and cheap that they're routinely incorporated into all kinds of ordinary devices for every-

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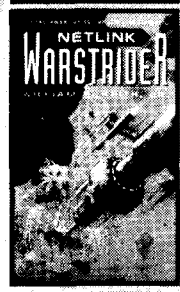

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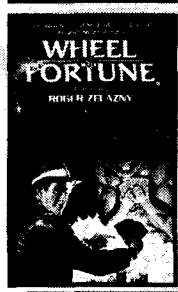

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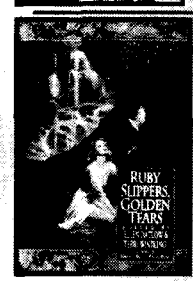

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day use, making them more versatile than ever before. Thus it is that things like cooking appliances and sound equipment can be programmed to do a wide range of complex sequences of tasks. In late-model cars, computers control all sorts of mechanical and electrical functions—and monitor them.

These days, if a component of your fuel system is starting to go bad, you may not have to make wild guesses as to what it is. When it acts up, the control computer stores a message that a particular type of malfunction has happened. The CHECK ENGINE SOON light comes on to tell you that it has done so. The proper response, according to the manual, is to take the car to a well-equipped mechanic as soon as possible after you first notice the light. He can read the computer message, and with luck it will tell him what part malfunctioned, or at least narrow the choices. (Of course, this nifty new ability doesn't come without a price—the monitoring equipment itself is another set of parts that can fail!).

Intermittent problems do occasionally show one redeeming virtue. In general, of course, broken inorganic machines don't fix themselves. Broken solder joints do not spontaneously regenerate—but sometimes they may get jostled into a relatively stable position and stay there for quite a while. The result looks very much like a spontaneous cure, even though it's really just an intermittent becoming less intermittent as mysteriously as it originally became more so. This, too, happens oftener than you might think. My personal experiences have included a watch that suddenly started running at near double speed, did so for one day, and then returned to normal for the rest of its life; and a stereo system that often went briefly monaural during one two-year period, then never did it again. You wouldn't want to count on that sort of thing, but it's comforting that it does happen occasionally. It might make you want to wait a while before rushing into an expensive repair or replacement of something non-critical.

Maybe someday we will actually have cheap, reliable autodiagnostic systems that can always go right to the source of an intermittent fault, and won't be an expensive liability in themselves. Until then, we'd probably better resign ourselves to mysterious intermittents as a normal part of life. And as long as that's the case, we'd better keep some good repairmen in business. When inanimate objects seem to be governed primarily by Murphy's Law, our best hope for dealing with them is a good, experienced, human-type intuition. Equipment maintenance is, after all, at least as much art as science. ■

It is a profitable thing, if one is wise, to appear foolish.

—Æschylus

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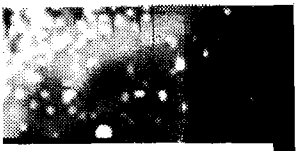

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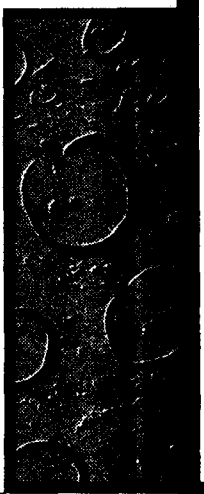

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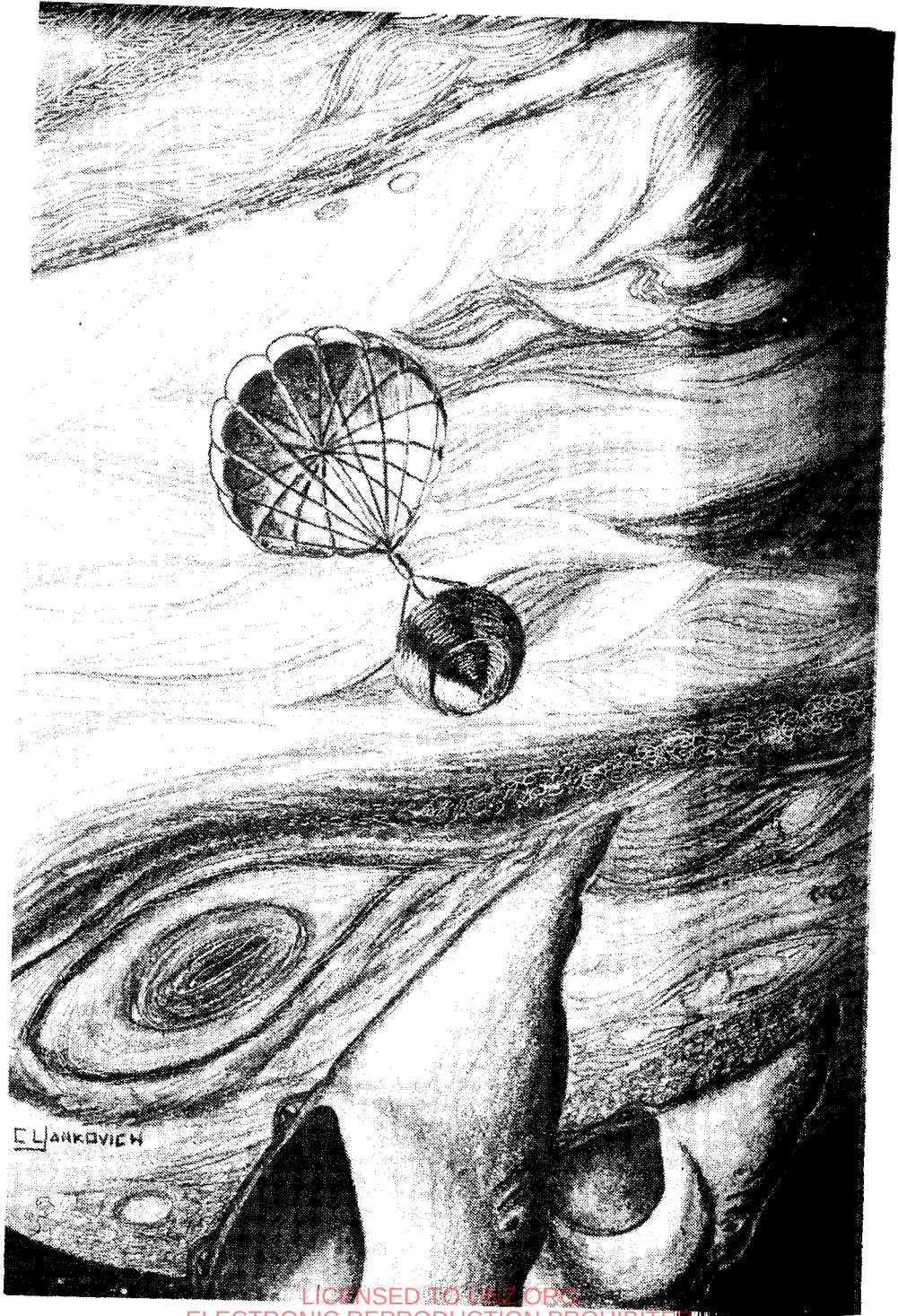

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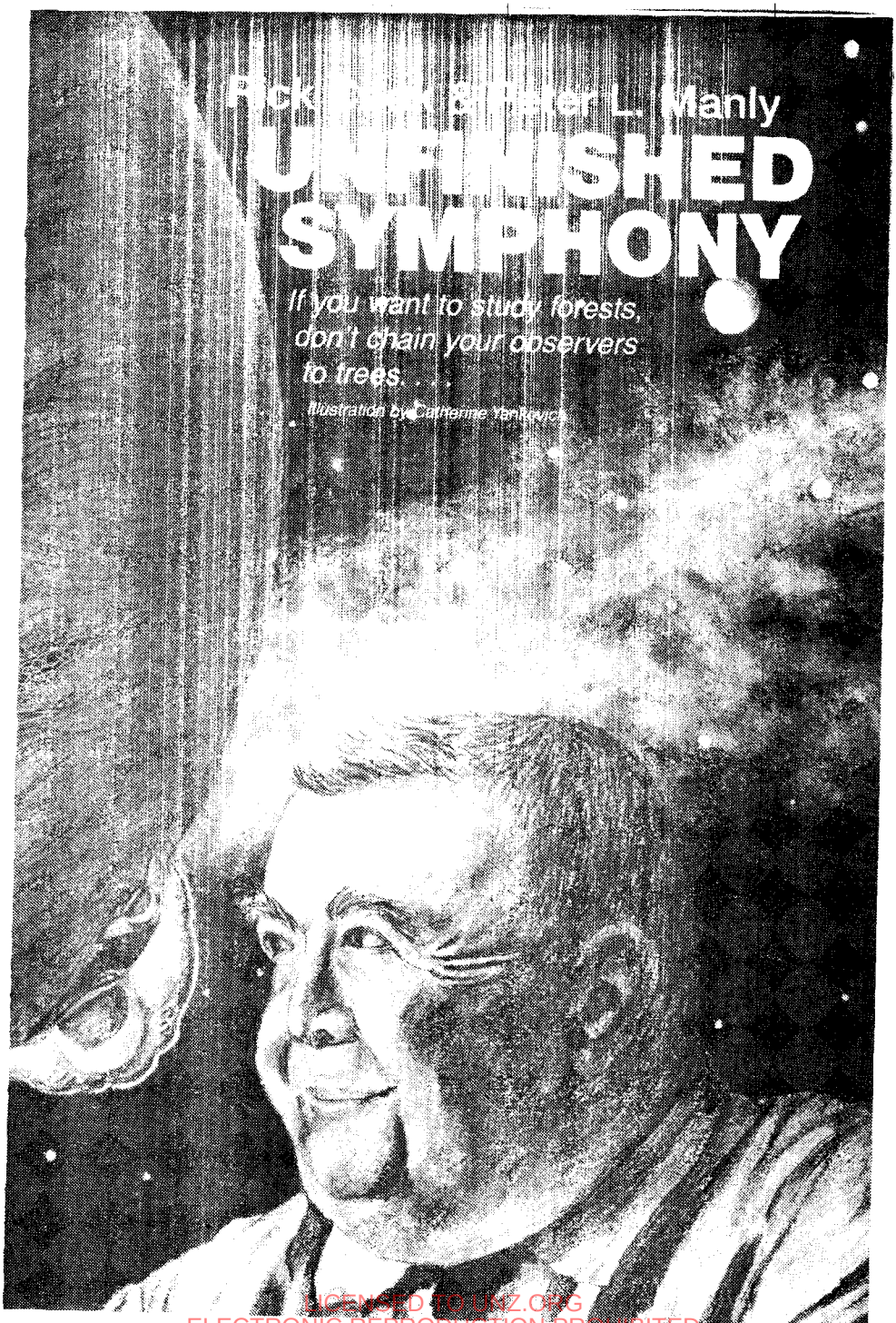
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If you want to study forests, don't chain your observers to trees.
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The eternal storms raged below, churning the clouds into cyclones big enough to swallow the Earth entire. Even here, thousands of miles above the melted-ice-cream swirl of the planet, other storms raged, filling space with a hash of radio noise and a sleet of charged particles.

The visitor sailed on, an untroubled tiny speck against star-scattered space and the light show of the atmosphere alike. It had traveled a long and circuitous path from its source, flung out from Earth by a combination of puny rockets and the massive forces of gravity. For five years it had caromed about the inner Solar System, banking off the gravity fields of the Sun and Earth like a well-played shot in a game of cosmic pool. Now after all the waiting, the planning, the improvising—after hopes and dreams and careers built upon it, it was ready to do the job it was designed for.

The spacecraft had not made the trip unscathed. The main antenna stood partially unfurled and crumpled like a broken butterfly's wing, useless victim of a mischance in space, millions of miles from any hand to tug it gently open.

Yet *Galileo* was not alone. Another man-made object flew in loose formation with it. Until five months ago it had been part of *Galileo* in its long journey through the Solar System. Then, on command, the atmospheric probe had detached itself and drifted away. Where the rest of the craft was lumpy with antennas and booms and other projections in cheerful disregard for considerations of streamlining, this piece was as smooth and curved as a stream-worn pebble. It was designed to plunge into Jupiter's atmosphere and bring back news of conditions never before experienced by humans or their creations.

Behind them, above them, and below them loomed the fiery bulk of Jupiter, banded and braided and twisted in a thousand shades of orange and red and yellow and white.

The spacecraft were as incapable of being awed by the planet's size as they were of being impressed by its beauty. Months from now, after the probe had transmitted information back to the orbiter and it had been forwarded bit by bit to Earth to be assembled and interpreted, then perhaps the humans who created the craft would be awed or impressed. But that was utterly beyond *Galileo*'s capabilities.

With a puff of gas from thrusters, the *Galileo* orbiter took a slightly different course from its companion, one calculated to just miss the planet. The companion would not miss at all. Indeed, it was not designed to miss. Its job was to dive into Jupiter's atmosphere and send back word of what it found.

The probe's builders had considered carefully, weighing the desire for information against mass, communications bandwidth, and a hundred other factors before settling on just six instruments to collect data in the hour or so before the device was crushed to extinction in the depths of the massive Jovian atmosphere. Six instruments to extract the maximum possible amount of information given

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the conditions the designers expected the probe to encounter.

And no one on Earth had a clue as to how wrong they were.

"Storm up ahead." The Geek broke into the strained silence.

Ensign was well aware of the towering, roiling mass of lemon-yellow clouds several thousand wing lengths beyond. But he was glad for anything that broke the mood.

"It will be an active one," he sang out in the middle frequencies. "A lot of lightning."

"My skin is tingling already," The Geek agreed. "We'll need to steer well clear of it."

Melody, the third surviving member of the Bach Choir, snorted on several selected frequencies to show she understood her pod-mates' ploy all too well and wasn't—quite—ready to oblige. The result shivered Ensign's hearing membranes, but he took it as a good sign.

"Rich feeding to come, though," The Geek sang judiciously. "A storm that big will bring up plenty of plankton."

What The Geek actually said was considerably more complex. The speech of creatures who can talk and listen on a hundred or so frequencies simultaneously naturally carries much more information than any human language. Besides the banal comment on the weather, The Geek had expressed his people's truism that change is eternal and that bad times often unfolded into good. He had added a certain amount of onomatopoeia for comic effect to show he said it in good spirits and, perhaps most importantly, it chided Melody for her attitude.

Melody snorted again, less forcefully this time.

The three soared in a loose triangular formation perhaps a hundred wing lengths above the yellow-and-cream cloud tops. Their manta bodies were buoyed by their internal hydrogen chambers and propelled by flapping their enormous wingtips. Each member of the pod would have covered most of a city block on Earth, but none of the High Folk could have survived an instant's exposure to Earth conditions.

All around them plankton welled up from the clouds below, growing and blossoming in the weak sunlight. The three had deployed feeding scoops and opened the gills along their massive flanks, forcing Jupiter's atmosphere through their bodies and straining out the nourishing plankton.

Melody trilled a bell-like chime on a hundred frequencies at once. "Listen," she sang with ringing overtones to remind the others of her singing abilities, "I know we have to have more members to be complete. But the Bach Choir is—was—the finest singers in our whole cloud belt. Snow has no clear voice and little musical imagination."

"We also need singers who understand the songs they sing," The Geek replied. "Snow already knows many of Old Simon's songs of astronomy and computation. More, she will be able to use them as he did to predict the motions of the Heavens—she can

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already foretell moonshadows so Gatherings can take place."

"She is barely old enough to leave her birth pod," Ensign added. "She will mature."

"But will she develop? She shows no sign of it. We need singers."

"We also need memory," Ensign sang back. "She can give us that."

Ensign hefted the weight of his own memories—literally. Clinging to his flanks and body were dozens of remoras, torpedo-shaped symbiotes whose talent was remembering. When the pod had been shattered in Skyfall of multiple comet strikes, he and the other survivors had acquired many of the songs and memories of those lost.

"Flashing eyes and a pretty set of wingtips, you mean," Melody retorted in mock derision. "Memory yes, but we need real singers if we are to be great again."

"Besides," The Geek said quietly, "we all lost some of our hearing in Skyfall. Others will sing more sweetly—but we have most of the memories and ancient knowledge from those who perished."

Someone finally said it, Ensign thought. The thing they had been dancing around, not-quite-ignoring, ever since their harrowing dash to safety, away from the cloud bands hammered by comet strikes. The shockwaves had killed many of their pod mates, those who hadn't elected to stay behind in the south or who had not been taken by sharks on that terrible journey. And the three survivors had not passed unscathed. None of them would ever be the singers they had been before Teacher warned them of Skyfall and led them North. Ensign wondered if the pod could even continue as a true choir.

"All the more reason to recruit only the best singers," Melody trilled stubbornly. But Ensign could see her heart wasn't in it any more.

Ensign sighed, wondering how he could keep his bickering pod mates together, much less expand the group. They needed at least six more of the High Folk to sustain a functioning pod and that meant recruiting from other pods here in this alien place. He gazed at the young apprentice Snow, discreetly grazing out of earshot while they debated her fate. *So young,* he thought, *so very young.*

"We still have more remoras than we can easily carry," The Geek sang on. "Snow can carry them and she can harmonize to the technical knowledge we barely understand."

Melody remained silent, a sign that she disagreed but would not further object.

Looking at her, Ensign felt more than a twinge of sympathy. Before Skyfall the Bach Choir had been the most renowned singers in their entire cloud band.

The Geek called out to Snow, "Come join us, fly in the gentle wake of our pod."

"I come." Snow's response sounded as a single, clear note. She had never sung so well before, Ensign thought. Perhaps the new member of the Bach Choir was a promising vocal choice after all.

Suzanne Quinlan—*Dr. Suzanne*

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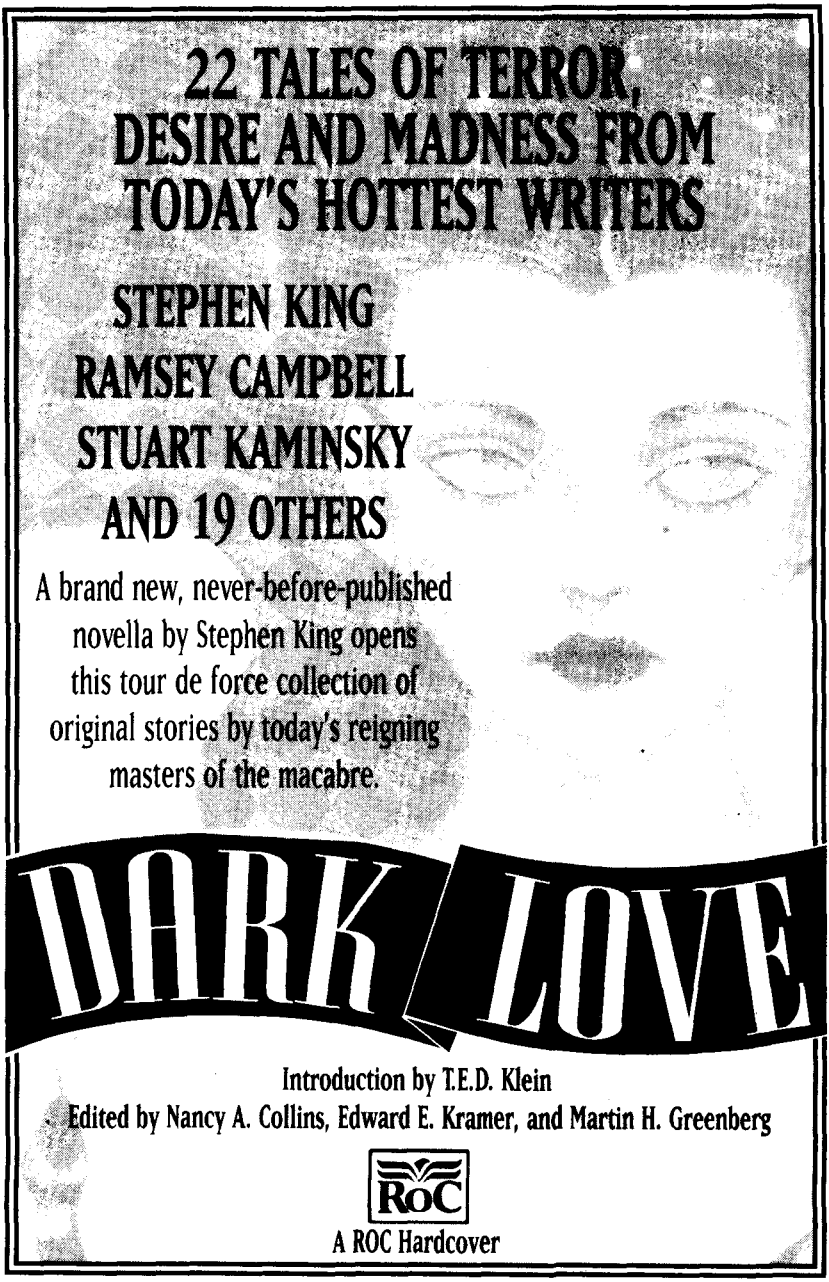
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Quinlan, she reminded herself—really had no business in the Deep Space Network control room. But she was there because in a few hours the *Galileo* probe would plunge into Jupiter.

Not that you could tell from the control room. The two consoles were dark, the desks appeared unlittered and the only people in the room were herself and F. Gary Rhine, who appeared engrossed in some kind of equipment check.

"Control room" was a misnomer for *Galileo*. The controlling was done by the computer on the spacecraft. Even at the speed of light it was nearly an hour from Earth to Jupiter, far too much lag to actually control anything directly. Nor would there be a flood of data, instantly translated into pictures. With the high-gain antenna useless, the data information would crawl back to Earth over the next weeks and months.

The control room was not manned because it didn't need to be. It was still early morning and the probe would not penetrate Jupiter's atmosphere until mid-afternoon. Rhine was there because he had work to do. Suzanne was there because, well, because it seemed *right* somehow that she be in this place. In a way this was what she had struggled through graduate school for, why she had labored over her dissertation and fought the growing disillusionment as she came to understand what a Ph.D in planetary science was really worth. In a way it was keeping faith with the promise implicit in all those magazines with the bright covers her father had carefully stored in the basement. Whenever she thought of that she remembered the rainy afternoons with the damp creeping into the basement and the woody smell of old paper in her hands.

It would have been better if there had been someone to share it with, but The Rhino's reputation and air of fierce concentration didn't encourage casual conversation.

The phone shattered the stillness and made her jump. Without thinking, she picked it up.

"DSN Control, Dr. Quinlan speaking."

"Is this the Deep Space Network?" asked a nasal voice.

"Yes."

"White House operator. Hold for a call from the vice-president's office."

Suzanne looked around frantically for someone to hand the phone to, but Rhine kept his back to her as he fiddled with his instruments.

"Hello?" The voice didn't sound anything like it did on television. "Terwiliker here. I need to speak to whoever's in charge."

"What?"

"Claude Terwiliker, special assistant to the office of the vice-president. Who's this?"

Suzanne assumed her best tone of authority, "This is Doctor Quinlan. How may I help you?"

"We need a statement about that probe that landed on Jupiter. Also some pictures."

Suzanne's jaw dropped. "But—"

"Look, honey, let me talk to someone who knows what's going on. OK?"

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Suzanne colored to the roots of her hair. Before she could say anything else, Gary Rhine reached over her shoulder and slammed the speakerphone on with a swipe of his hairy paw. "Who the hell is this?"

"This is Terwiliker, special assistant to the office of the vice-president of the United States. Who's this?"

"This is F. Gary Rhine."

"Well, Dr. Rhine. . . ."

The Rhino frowned so deeply that his bushy salt-and-pepper eyebrows nearly met in the center of his forehead. "*Mr.* Rhine," he growled. "Now what do you want?"

A brief pause. "The Vice-President needs photos of the surface of Jupiter from that spacecraft, ah *Galileo*?, for his speech tomorrow."

Rhine expelled breath between clenched teeth. "Did you get the briefing package our flacks sent you?"

"The Vice-President needs the very latest," Terwiliker insisted.

"Did you read what you've got?"

Another hesitation then the voice firmed. "This is getting nowhere. Put your supervisor on."

"Son, it's just after six A.M. here. I'm the closest thing to a supervisor you're gonna get. Now, did you read that stuff?"

"Well. . . ."

"Because if you had," The Rhino roared, "you'd know the damned data isn't going to be available for weeks—thanks to the damned antenna that jammed because you damned Beltway idiots wouldn't authorize a damned high-energy launch. You'd also know that even when the damn data does come limping through there won't be any damned pictures because the damn probe doesn't carry a damned camera." He got all that out without taking breath. In spite of Suzanne's terror she was impressed.

"Hey, don't get upset. I'm only doing my job. The Vice-President has a press conference this afternoon and he wants to be able to say something about the program."

"Tell him it's on schedule."

"OK. I guess that's better than nothing!" The line went dead.

Suzanne finally managed to get her jaw closed as The Rhino reached over and slapped the speakerphone off. "God," he growled, rolling his eyes upwards, "I *love* this job."

"Was that wise?" Suzanne quavered.

"No, that was a bureaucrat. Worse, a political appointee bureaucrat. They're not even sentient by any reasonable measure."

"I mean, can't he retaliate?"

The Rhino snorted explosively. "And let people know he was ass enough to call in the first place? Not likely. He'll keep his mouth shut and just hate me quietly." He grinned. "It'll be good for his scum-sucking little soul."

"I can't believe he thought Jupiter had a solid surface," she said, still shaken. "Not to mention that he didn't know it will take signals nearly an hour to reach us."

"Where bureaucrats are concerned, believe anything. Except intelligence, Mzz Quinlan," he dragged it out like a buzzing bee.

"Doctor," Suzanne muttered.

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"I beg your pardon?"

"It's *doctor*," she said more distinctly. "Doctor Quinlan."

"Don't worry," The Rhino said cheerfully. "I won't hold it against you." With that, he turned back to whatever it was he had been doing.

Galileo swung close to Jupiter, listening to the radio hiss, tasting the stream of particles tossed off by its moons and trapped in its magnetosphere. It sped above the dusty ring plane. Far below, the probe drifted ever-faster toward the planet, oblivious of time and travel and its eventual fate.

If *Galileo* wasn't intelligent enough to be awed by what was around it, the probe wasn't even smart enough to be called automated. A two dollar oven timer had more smarts than the sequencing switch that was the closest it came to a brain. Only when the crushing deceleration of atmospheric entry actuated a simple sequencer, would the probe take any action.

That time was fast approaching. The probe slid down the gravity well towards Jupiter at ever-greater velocity. The tenuous outer edges of the planet's atmosphere began to take hold, tentatively at first and then ever more firmly as it grew thicker and stronger. Invisible fingers of gas tore at it, and the heat shield began to glow from the impact of the gas molecules.

The heat shield sprang away and the parachute streamed out behind. Then the radio transmitter began to broadcast the readings of six sensors, verbatim. Swinging gently under its parachute, the probe began its one-way descent into the clouds of Jupiter.

Ensign browsed on and watched Melody and Snow, grazing while practicing a simple duet. The Geek angled over and hummed quietly, "Looks like Melody has accepted her."

Ensign bobbed agreement. "A good start. But we need more members."

"They'll come—in time." His tone changed. "Shark, low and to the right."

Ensign's body tensed as he saw the small, dark torpedo shape dimly through the clouds and relaxed again when he saw that they were beyond its range. The predators of the clouds often followed the plankton swells in hope one of the High Folk would be hungry enough or foolish enough to graze the richer fields at the very cloud tops. Ensign sent a low frequency warning to Melody and Snow. They acknowledged on the same frequency without interrupting their song.

The Geek said, almost casually, "Snow says she knows of a large pod in the east that would probably be willing to share members."

"Oh? Does she know any of them personally?"

"No, only that the pod is ready to split. They deplete the plankton fields too fast and must constantly move."

Ensign nodded. "Wise choice. Especially if there are calves. The constant travel saps their strength and they grow up weak. Perhaps we will drift eastward for a while."

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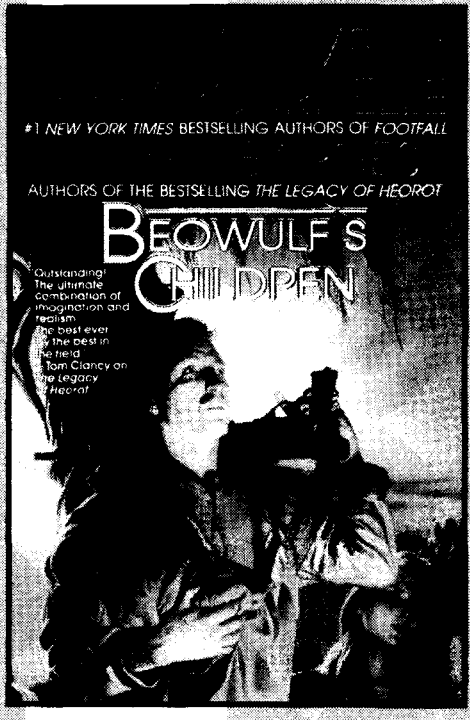
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"SKYFALL!" Melody's hysterical warning carried secondary tones indicating danger from the south.

Ensign used his upper eyes to find a bright white object arcing toward them while his lower eyes searched the clouds for a place to run—but a second shark appeared down in the clouds. Within seconds it became obvious that the piece of the sky falling near them was nowhere near the size or speed of a devastating comet. Indeed, as it came lower it dimmed to red and then a piece broke off. "Relax—it is a small skyfall. No danger. Just stay away from it." Ensign had heard stories after the last Skyfall of small, hard solid things falling with the comet—stones that could pierce the soft tissues of the High Folk more easily than a shark's jaws.

Then a long, dark streamer spun out behind the thing. Ensign thought it the strangest thing he'd ever seen in his life—until he saw the streamer blossom into a circular canopy attached to the object by sinews. It slowed greatly in its descent and swung back and forth below a billowing arc.

Suzanne Quinlan watched the data stream carefully on her monitor. Normally, sitting watch in the Deep Space Network Control Room was about as exciting as watching paint dry. This afternoon was no different. NASA's large dish antennas scattered across the globe regularly communicated with a handful of interplanetary craft all over local space—and a few which had left the Solar System entirely. Her job was to make sure all the pieces of equipment—antennas, receivers, data recorders, communications links—and the people who operated them, followed a complex and ever-changing schedule.

Forty minutes ago the *Galileo* spacecraft had started a scheduled data transmission. The Earth-bound antenna it sought was still transmitting instructions to a satellite orbiting far above the south pole of the Sun. Just before *Galileo*'s message reached Earth, the antenna, located in Australia, swung around to hear it.

"Anything new?"

Suzanne started at the voice, and looked up to see F. Gary Rhine standing behind her.

"We've got some data." She hesitated. "How was the administrative meeting?"

Rhine pulled a chair up and sat on it backwards. "If I told you it was stirring and inspiring would you believe me?" She didn't respond as she searched the data stream for housekeeping bits that marked off blocks of data.

"If I can just hold on for another eight months of this equine excrement," Rhine continued in his usual growl, "I can retire. Now they say we have a new performance review procedure we all have to go through."

Suzanne looked at him out of the corner of her eye, not quite sure what to make of her new acquaintance. Rhine's irascibility, explosive temper, and way of charging problems head-on had earned him the nickname of "Rhino." She'd heard the water cooler gossip that he knew where every body and skeleton in all

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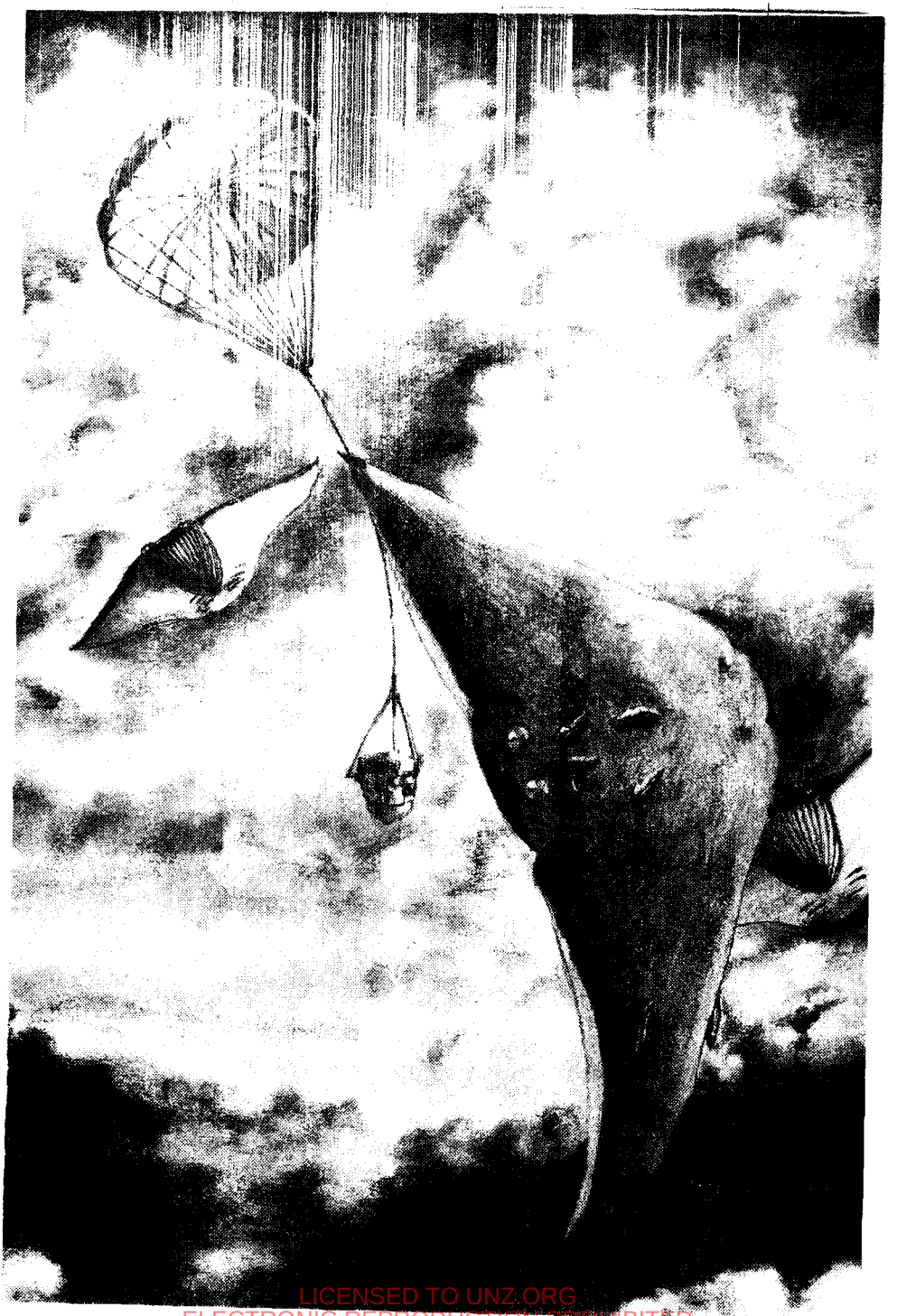

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of JPL was buried. Supposedly he had started his career playing with V2s at White Sands in the early '50s, and had spent all his life working with rockets and spacecraft. He was one of the few who'd lasted through the decades of budget cuts, killed programs, layoffs and program reorganizations. She decided she rather admired him, in spite of the fact that he made her profoundly uncomfortable.

"There it is!"

"What?"

"Memory allocations!" Suzanne pointed to the screen. "These blocks are probe data. Looks like we got a good chunk of data."

F. Gary Rhine sighed. "Well, at least something went right today."

It was Suzanne's turn to snort. "All we know for sure is the probe data's been stored in these memory blocks—it may all be incomprehensible garbage, but at least it's duly recorded incomprehensible garbage."

"Little cynical this morning?"

Suzanne sighed. "I guess." Then on impulse she added: "I mean it's exciting and everything, but it's not the way I thought it would be. There's all this trivial junk—like performance review meetings—and so little of the important stuff."

"There's damn little of the important stuff any more," the older man told her. "You want my advice? Get out and go do something else."

Suzanne grimaced. "There's not much you can do with a Ph.D in planetology. But what about you?"

The Rhino shook his head. "I'm not as valuable as you might think. Most of this place runs on '60s and '70s technology, years behind the commercial stuff. I'm not so much a technical chief as I am curator of a communications museum." Then the little-boy grin. "Besides, I'm sticking around to see what happens next."

What next? Ensign thought as the strange thing came lazily down, borne slightly east by the prevailing winds. *First Skyfall and now this.*

The Geek watched the strange object drift toward them. "Is it alive?"

"It's moving," Melody offered.

Snow slipped beneath it to use her upper eyes. "It swings rhythmically." She ventured a song of greeting. The thing remained silent.

The Geek moved in, "tasting" the probe with beams of sound. The upper round canopy was a membrane of some sort, but the lower section was unlike anything he had ever seen.

"It reflects," he sang in wonder. "The lower part reflects almost everything."

Even from his distance and angle Ensign could feel the reflections of The Geek's song. That made him even more wary. Everything in the High Folk's world reflected sound, but imperfectly. A probe of the right frequency told you something about the inner structure of things. But this object was reflecting everything from its surface.

For the moment he ignored the membrane as being more-or-less familiar and concentrated on the lower part. The small sphere wasn't quite smooth. It had crisp markings in regular circles and lines. He compared it

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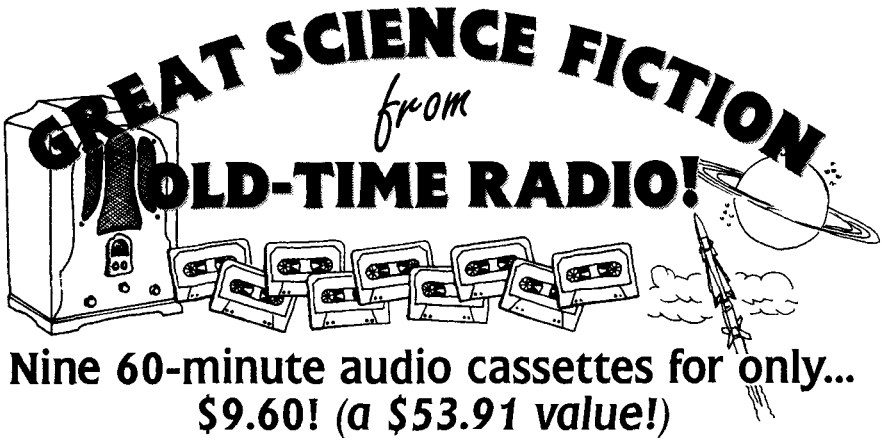

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to the mottled skins of his own folk, sharks and plankton. A ray of sunlight glinted off the shiny surface, a phenomenon he'd seen only when looking into the eyes of others. "It's smooth. Very smooth. I don't see how anything would grow up like this!"

"It's so hot," Snow said.

The High Folk's infrared detectors were not nearly as sophisticated as their natural sonar or their eyes, but it was obvious this thing was much hotter than the surrounding air. Even the living things of the cloud depths didn't get this hot.

Ensign turned toward it. "Dead things fall, living things fly." He eyed the mysterious object suspiciously, noting that the edges of the upper part fluttered in the breeze. "Keep your distance—it may be some kind of predator. . . ."

Ensign climbed to gain a dominant position over whatever it was.

"Where does plankton like this grow?" Snow asked her more experienced pod mates.

Sky seed? It was a logical assumption. There were certain kinds of plankton that grew sails or drogues to better reap the rich energy harvest of the sunlight. But it didn't feel right to Ensign. Plankton were tiny and soft. This thing was larger and its body appeared disturbingly hard.

Above the clouds there were only the High Folk, sharks and plankton of many different kinds. Most of Jupiter's vast and complicated ecology was down in the cloud seas and known to the High Folk only as humans knew the depths of their own oceans. Sighting new kinds of life was rare for the High Folk, but it did happen.

"How do you know it grew?" Melody trilled. "This comes from the sky and who knows how things form there?"

"Keep away from it," Ensign called again. But the fascination felt too much and all of them eased closer.

Snow slid out from under the thing and gained altitude, coming abreast of it. "Maybe somebody made it," she offered.

The Geek snorted in derision, "You can make music and ideas—you can't make things!" He glided closer.

"I told you to keep your distance." Ensign called sharply. "Snow, you're also too close." He turned to pass over the ballooning canopy, examining its texture and colors with his lower eyes. Suddenly his tingle sense came alive. A massive lightning strike was building to the east.

"LIGHTNING—BREAK WEST!"

As one, the pod sheared away. The response was so instinctive it was several seconds before any of them realized there were no clouds to the east to generate lightning.

Ensign felt foolish for calling a false alarm. Then he realized that the tingling he'd felt wasn't the usual hash of static but rather something alien, regular—like a song sung by lightning.

This was even stranger. The High Folk could stimulate each others' tingle sense, but only at very close range. It was a calf's trick to sneak up on an adult and fake a lightning warning to watch the adult break away.

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But that was a fluke ability, a nearly useless side effect of the sense that kept the High Folk from flying into areas of high electrical potential where their mere presence could trigger a shattering lightning bolt. Why could this thing invoke the tingle sense?

Snow's inarticulate cry jerked him out of his reverie.

Snow was tangled in the Star Seed's sinews, its sail billowed out over her wing and the hard object hung below it. When he'd ordered the pod to turn, he had inadvertently directed the newest member of the group directly into the strange object. Snow floated frozen, terror in her eyes. Ensign asked, "Snow, are you all right? Is it burning hot?"

Snow's voices came ragged and panicky. "I—feel—lightning—warnings—from—everywhere!"

Gary Rhine sipped his coffee and watched the traffic stream by the coffee shop. His turquoise-and-silver bolo tie and white short-sleeved shirt barely met the standards for office dress. His sport coat hung on a hook in his cubicle, still wrapped in plastic from the cleaners.

The late afternoon meeting was as unofficial as the setting. No one in the PR office would have dreamed of letting The Rhino near the press and Rhine held the media in general in contempt. But then Larry Collins had officially turned over coverage of planetary encounters to younger colleagues at the bureau after *Voyager* passed Neptune. Although he would file a color story for the wires, this was more a meeting of old friends.

"The probe's radio antenna points upward and broadcasts a conical beam to *Galileo* overhead," Rhine explained as he marked the napkin with bold scrawls of a felt-tipped pen. "We timed the probe's entry so the spacecraft will be in the cone at the right time." Another series of circles, slashes and heavy dotted lines bleeding black and fuzzy into the napkin. "The Earth is right at the edge of the beam and the National Radio Astronomy Observatory's Very Long Baseline Array in Socorro, New Mexico, listened for the signals during the probe mission. They say they got the signal."

He pulled the napkin back for some more scrawls. "Now our next job will be to see if we can pull a Doppler signal out of those data and determine the horizontal drift velocity of the probe, which will tell us something about Jupiter's wind strength. If we're lucky we may get a vertical velocity, too. That could be correlated with the altitude data that's supposed to be transmitted from *Galileo* in a few days." He paused. "If we're real lucky, we may even be able to decode the modulation and obtain raw probe data."

"So the mission's a success?" Collins asked as he studied Rhine's handiwork.

Rhine shrugged. "So far. Or it was when I left. God knows how it's managed to fuck up while we've been sitting here drinking coffee."

Larry lifted his white eyebrows in mock surprise. "Cynical, ain't we?"

"Let's just say I'm a devout believer in Murphy's law." Another sip of coffee and then a broad grin. "Hell, I

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knew Colonel Murphy back at White Sands."

"So you've told me. And as I recall you always thought he was an optimist."

Gary chuckled. "Sonofabitch was." Then he glanced at his watch. "Well, I gotta get back and massage some electrons."

Larry picked up the check and stood up. "Yeah, I suppose I should go do something productive too. Like write something about this that maybe someone, somewhere will want to read. You got any hot surprises for me about the mission?"

The engineer grinned like a little boy. "Oh, lots of them. We just don't know what they are yet."

"So the only surprise would be no surprise, eh?"

"Larry," Rhine said completely sincerely—and utterly incorrectly—"the only thing that could surprise me is if the probe mission went off perfectly."

The Geek hovered over the Sky Seed, at once fascinated by its song and afraid of its signals as lightning warnings. Melody circled warily, her shadow falling on the tiny sphere at the bottom. Suddenly The Geek exclaimed, "The song changed—it definitely changed just for a moment there!" Melody circled back, eyeing the sphere closely.

When her shadow covered the Sky Seed again, The Geek sang out that the song had changed a second time. "It responds to you, Melody! It is alive!"

She shuddered slightly, moving away from the thing, but The Geek pressed even closer. Meanwhile Snow was slimmed to a fleeing shape and maintaining her altitude with jerky little motions of her wingtips.

Ensign lay off to her side and sent her a constant stream of reassurance. Her plunge away from the non-existent lighting had left several of the shroud lines tangled around her body and the canopy draped over a wing. She might be able to free herself by violent maneuvering, but Ensign was afraid that would cause the searing hot Sky Seed to touch her with disastrous consequences.

The Geek was still experimenting with casting shadows on the thing to hear its song change. Occasionally he tried to speak to it, but it would not respond on any frequency. Melody hovered off to the other side, trying to encourage Snow without getting too close to the thing.

"Snow," Ensign sang, "You need more buoyancy. We're getting a little too close to the clouds. So just relax a little and let your body expand. Can you do that?" Snow shivered, a gesture that might have been agreement. "That's good. Now just a little bit more. OK? A little more. You're doing fine."

"Come on," Melody chimed in in multi-part harmony with the deep overtones of a mother calling her calf. "Come on, Snow, you can do it. Just a little more. Just a little more."

With his lower eyes Ensign kept scanning the clouds below. He couldn't see any sharks but he knew they were down there and probably keenly aware of the the group above

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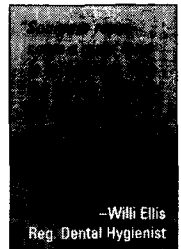

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them. They were still out of range of a shark's lunge, but they wouldn't be much longer. If they couldn't get Snow to expand soon they'd have to face the sharks in the clouds.

Gradually, with a stream of encouragement from all three of them, Snow started to relax and expand. Once or twice she made convulsive, jerky movements of her wingtips as if she wanted to fly for all she was worth, or worse yet, jet upward on a stream of expended hydrogen. But flapping might have tangled her more in the thing and expending hydrogen would leave her less buoyant.

Then slowly, very slowly, Snow began to rise again. Ensign and Melody stayed beside her, encouraging her and talking to her to keep her relaxed. The Geek drifted back and started examining the thing trailing at the end of the lines.

"It's getting weaker," he reported to the others. "It isn't singing as loudly." He paused. "I think it's dying."

"Keep listening," Ensign told him. "Let us know if it dies completely." He hoped the thing would relax its grip in death and release Snow. If it didn't they would have to take more drastic measures.

"Weaker, weaker," The Geek sang. "Very much weaker. Now, nothing. No song at all."

Ensign studied the thing with probes of sound. It was much cooler than it had been, but its structure hadn't changed at all and it showed no sign of releasing Snow.

"All right, we'll have to get it off her," Ensign sang. He sent a quick message to his remoras to see if any of them had any songs that dealt with a situation like this. But the only songs about contact between High Folk the remoras carried involved sexual techniques, a kind of Jovian Kama Sutra that wasn't much help here.

"Snow," Ensign sang, "bank right. Please forgive me, but I am going to come above and behind you in mating position to try to work it off with my wingtips. Will you trust me for this?"

Again Snow gave a frightened bob of assent.

Ensign maneuvered above and behind the young female, fighting down the arousal the position produced. With Snow banking toward the parachute and probe, part of the canopy slid off her wingtip and instantly billowed out in the hurricane force wind.

The drag threw Snow off balance and Ensign banked desperately to avoid crashing into her. He slid by her, batting at the canopy and shroud lines with a wingtip, trying to scrape them off. Snow turned belly-on to the wind as the canopy's drag increased and then she was free, the dead thing falling away under its fouled, partially expanded canopy, and dropping into the clouds below. Ensign wondered briefly what the sharks would make of the Sky Seed.

The Sun had long since settled into the Pacific Ocean in a dirty orange smear and it was full night in California. But Rhine and Ed Steveberg, an engineer on loan from the VLA, were hip-pocket deep in the first big sur-

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prise of the day and oblivious to the time. Steveberg was young, thin, and blond with a slightly squashed beak of a nose and a bit of a contact squint. Just now his scowl was as deep as Rhine's.

Beyond the doors of the conference room a carefully concealed air of genteel panic was spreading through the probe team. By tomorrow morning, when most of the staff came in, the panic was likely to be a lot less genteel. Rhine and Steveberg weren't panicked, but they weren't real happy either.

"So," the Rhino growled, "we got two major anomalies and a possible probe glitch. First, the probe signal has no vertical velocity component and apparently no horizontal component either. Second, you think something intermittently blocked the radio beam." He glanced up. "Let's go over that again."

Steveberg tapped the printout with his pen. Everyone else had called the information up on screens, but the Rhino felt more comfortable with printouts. "We see gaps in the data where the signal fades for several seconds at a time. It's not a problem with the receivers here on Earth because it shows up in all the Earth antennas simultaneously—something happened out there at Jupiter."

"Intermittent transmitter failure?"

"No, for two reasons. First, when you first turn the transmitter on, it hunts in frequency for a second or so. The frequency of the probe signal is steady—ergo, something blocked it. Secondly, the signal doesn't just snap off and on—it fades out and in."

Rhine rubbed his chin and spread his lips in a mirthless smile. He loved a good technical mystery—it made the job worth doing. "How about if the probe were swinging below the parachute? The transmitter antenna is aimed up the shroud lines."

Steveberg frowned. "If it's oscillating under the chute, I'd expect a regular fading and return." He gestured toward the signal history. "This looks pretty much random and intermittent."

Rhine looked at the displays, glanced at the data summary printouts and took note of the two other engineers assigned to the task. His expression and demeanor were as serious as the occasion demanded, but inside he was grinning and rubbing his hands with glee. He knew he wouldn't get any sleep tonight, but he relished the detective work ahead, was glad he'd been given the resources and people to get the job done. They'd handed him an interesting task. The fact that a dozen other teams were working on the same problem all around the world didn't detract one whit from the excitement.

"God," he muttered under his breath, "I love this job!"

Fourteen hours after the probe stopped transmitting, *Galileo* approached the edge of Jupiter's disk as seen from Earth. For a while it would be out of touch, hidden by the bulk of this alien world. Just as it started behind the planet, as the image of Earth shimmered and blurred under the effects of the Jovian atmosphere,

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it broadcast a data stream to eager antennas on the Home Planet. Scientists would note the signal's absorption and attempt to discern the density and perhaps the composition of gasses in the higher reaches of Jupiter's clouds.

"Shit," said F. Gary Rhine as he looked at the latest data reduction from the *Galileo* probe. The number crunchers had used the whole night to crank on the probe data and they'd gotten a preliminary flight path profile. What the computers had churned out wasn't comforting.

"I don't suppose the damn altimeter could have gotten stuck?"

Ed Steveberg shrugged. "I don't see how, but that's Instrumentation's pigeon."

"OK," Rhine said, looking at the group clustered around the table, "I will grant you the circumstances are suspicious as hell. According to our tests everything in the comm pathway is functioning perfectly." A raised eyebrow told them how likely Rhine thought *that* was. "But so far we can't find anything that would cover the facts."

Another senior engineer stabbed a finger down on the graph of the probe's path. "Well, the damn thing didn't just stop halfway down to take a rest."

"Bad weather?" someone else suggested. "The probe might have gotten caught in an updraft."

"That would take one hell of an updraft."

"So? How much do we really know about the conditions in Jupiter's upper atmosphere?"

"Obviously not nearly as much as we thought we did. OK, so assume it's an updraft—a hurricane blowing straight up—why did the signal keep fading?"

"That's easy," Steveberg said. "The probe was getting tossed around and it kept losing alignment."

The Rhino grunted. "That doesn't feel right. It looks more like something was blocking the signal."

"What? It was hung up on a tree limb and the branches kept getting in the way or something?"

F. Gary Rhine cocked a furry eyebrow. "Or something." He scowled down at the latest data. Normally troubleshooting a complex system involves formulating and testing hypotheses. And normally the problem is eliminating the hypotheses down to a testable number. Here they had every engineer's nightmare. There were simply no testable hypotheses that could explain what had happened in terms of a communications malfunction. Without theories to proceed on the team was just spinning its wheels. Logically that meant the problem was in some other team's bailiwick, but Rhine knew the other teams were also coming up empty.

He sighed. "OK, let's go back to the assumption that there was something wrong in the chain of communications. That's what we're paid to do, not worry about the weather on Jupiter. Let's go over it again and we'll meet in twenty-four hours. Maybe by that time we'll have some better information."

Ensign watched the Sun set. Snow

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hung on his flank like a calf, silent and withdrawn. For more than an hour she had been trapped by Sky Seed, terrorized by its song—or something like a song, he corrected himself—sung in the mode of a lightning warning.

Off to the side The Geek and Melody continued their argument. "I tell you it was alive! It responded to us. It sang!"

"But it didn't sound like a song and it stopped later." She paused for effect. "Living things don't look like that—all hard and smooth and shiny."

"Plankton don't look like us and they're alive. If you could have heard the song yourself—if you'd have flown above it—you'd know it was an intelligent message."

Melody snorted, "I'll stay as far away from such things as I can. Look at poor Snow—she croaks one-word responses since she managed to free herself from that thing."

Ensign interrupted, "Are we ready for Evensong?" At each Sunset the pod prepared for a quieter, more introspective flight.

Suddenly Snow wailed, "It's coming back! I can hear it!"

Ensign focused his tingle sense and found the signal, faint from the darkness and radio noise in the east. The tingle song was unmistakable but richer in variations. Not harmonic but faintly rhythmic. Snow sobbed.

"Yes! I can sense it, too! But it's different—a more mature sound."

Ensign tasted the song again. Normally the High Folk ignored the background noise in their tingle sense, filtered it out automatically without thinking. But by concentrating and bringing the crackling, hissing, popping hash of Jupiter's natural RF emissions to consciousness he was able to pick out the strange singing.

If Snow hadn't been sensitized to it by the Sky Seed I never would have noticed it, he thought as he strained his huge eyes for some indication of the singer.

Unseen to those below, *Galileo* passed beyond the limb of Jupiter, having beamed its message through the upper atmosphere. In about an hour the listeners on Earth would pick up its message and could begin to draw their conclusions about Jupiter. Meanwhile the Jovians were drawing their own conclusions about *Galileo*.

"That had to be an adult," The Geek maintained. "The mature form of the Sky Seed."

"Calling to its calf?" Melody wondered aloud.

"Perhaps." Ensign tried to sound judicious, mature, and realized he wasn't doing a very good job of it.

Snow wasn't saying anything for pod consumption, just huddling close to Melody like a calf with its mother. Ensign strongly suspected Melody was sending a constant stream of high-frequency reassurance to the badly frightened youngster.

"So these things live above and they communicate by tingle sense."

Ensign rippled a shrug. "Makes sense after a fashion. Our voices grow weaker as we climb higher and the pressure becomes less. Eventually the pressure must become so small

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voices can't be heard. The sunlight is stronger up there so plankton can grow large."

"But where is its calving ground?"

"Not here," Ensign said. "We would have seen it otherwise. Perhaps it calves above."

"Or maybe it calves in the layers below us and flies up into the sky to feed before returning to those lower layers."

"That seems unlikely."

"Then where is it from if not from the lower layers?"

"Here, let's see if we can find a good candidate. Snow, please loan me the remoras with the songs of the sky."

A half dozen remoras detached themselves from Snow and darted across the distance to Ensign's side. There was a certain amount of wiggling and tickling as the newcomers settled in.

"Let's begin with the 'Song of the Wanderers.' " There was more wiggling and tickling as one of the remoras positioned itself over Ensign's left dorsal earmouth and began to sing to the membrane. After an instant Ensign began to sing with the remora, transferring the information to his pod-mates.

Although the High Folk were by nature sound-oriented, the remoras' memories could hold pictures as well. Now the little symbiote wove a complex story of the Wanderers through the sky and what the people of Jupiter knew of them.

The High Folks's main eyes were more than two meters in diameter and they were backed by an elaborate neural image processing system. A Jovian's "brain" wasn't organized anything like a mammal's, but roughly 80 percent of its central neural structure was given over to receiving, interpreting, and sending signals. For the High Folk planetary astronomy was a naked-eye proposition.

But not a very popular proposition. Except for solar eclipses of Jupiter's moons, the High Folk paid little attention to what went on above them. However, among the remoras the Bach Choir carried were the remnants of those of Old Simon, the greatest of the Newcomb Pod, which had specialized in studying the skies for generations.

As the song wove on, Ensign, The Geek, Melody, and Snow were all entranced by the images forming before them. One by one the Wanderers spun out before them, as sharply and as clearly as generations of Jovian astronomers had managed to see them. As the first remora reached the limits of its memory, another took its place and another after that. Finally the "Song of the Wanderers" spun away into silence, leaving the images sharp in the minds of the pod members.

"The Second Wanderer!" Melody breathed. "It must be the Second Wanderer."

The others bobbed agreement. The First Wanderer was a featureless mass and the Third Wanderer apparently had only one, mostly brick-red, cloud layer. But the Second Wanderer showed cloud layers and patterns very like the ones they flew above—if it weren't for that disconcerting blue-green tinge to the lower layers.

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"It seems logical," Ensign said. "If these things have a calving ground in the sky it would be the Second Wanderer."

"So we have been visited by a being from the Second Wanderer," The Geek said slowly, "one who communicates by tingle sense."

Actually he said much more than that. By his frequency choice and faintly dissonant chords, he expressed how such a story was likely to be received. Like most of his people The Geek was a pragmatist. This thing had happened, so no matter how unlikely it might be, it was so. Accepting the explanation was another matter.

"Offering such a story will not help our reputation," Melody said at last. *And,* she did not have to add, *it will make it harder to recruit more members.*

Ensign damned himself for not seeing the implication earlier. The Bach Choir was new to this cloud band, their ways were somewhat alien and they needed to augment their number. No matter what their singing abilities they still lacked the prestige of an established pod. Like any intelligent species the High Folk understood rumors, tall tales, and downright lies, and like most intelligent species they were more likely to consign something completely outside their experience to one of those three causes than to accept it outright.

And there was no proof. The Sky Seed was gone into Jupiter's murky depths and no others had been close enough to see their encounter. They had their memories and the word pictures they could draw, but that was all. And neither words nor memories encoded the theory they had developed.

"*We don't have to tell anyone,*" Melody ventured at last.

They didn't like that either. Among the High Folk information was for sharing. Withholding it was like withholding food.

"Perhaps someone else saw the Sky Seed," Snow ventured.

"There was no one else close enough."

"Then perhaps there will be another one soon."

Melody snorted. "Have you ever seen one before? Do you even know of any songs about them?"

"Maybe we can call one to us," Snow suggested.

"If they communicate by tingle sense perhaps we can talk to them," The Geek said.

"How strong is your tingle sense?" Ensign asked. "That Sky Seed was easily as powerful as hundreds of High Folk."

"So we get hundreds of High Folk to sing to the Second Wanderer with our tingle sense."

"And how do we do that when we don't tell them what we suspect?" Melody retorted. "We either tell them and damage ourselves—and perhaps still don't convince enough High Folk to sing loudly enough—or we don't tell and no one will see any sense in trying to sing with the tingle sense."

No one said anything else. Ensign realized the entire pod was looking at him, waiting for his decision. *Sky*

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above, he thought bitterly, *I love being pod leader!*

Then the realization grew and finally burst in on him like full dawn on a clear day. There *was* a way!

"Let's not be too hasty to broadcast the news."

"So we do not speak of this thing, then." There were overtones of disgust in The Geek's voice.

"No," Ensign thrummed slowly. "We don't *speak* of it."

"Associated Press, Collins."

"What the bloody hell," bellowed a familiar voice in his ear, "is this nonsense?"

Larry didn't need clues to identify either the voice or the " 'nonsense.' "

"Hi, Gary. Hey, I didn't write it."

"I can read a byline," Rhine growled in his ear.

"Yeah, well he's got this odd notion that if you don't find what you expect to find the experiment is a failure."

"Doesn't know John F. Feces about research, does he?"

"I think his degree's in sociology," Collins agreed. "He's got a master's in journalism—which makes it worse because he won't listen to anyone."

"When the hell are you going to get some science reporters who know something about science? An 'expensive failure,' my ass!"

Collins leaned back in his swivel chair. "Well, you gotta admit you didn't get the data you expected out of the probe."

"We got data, dammit!"

"You mean you got a signal back that doesn't tell you anything."

"Wrong. It tells us a hell of a lot. It tells us Jupiter isn't like what we thought it is."

"You mean it's got hurricanes blowing straight up?"

"I mean it's got something."

Collins pounced. "So the hurricane story isn't completely accepted at JPL?"

"Only by the ones who can't find their asses with both hands. I'll grant you that's a lot of them, but not everyone by a long shot."

"OK Gary, what's the alternative theory?"

"There are a bunch of them," Rhine's voice dropped almost to a mumble.

"Name three."

"Later, Larry. When I get them sorted out."

"Which one do you think is the most likely?"

There was an uncharacteristic pause on the other end of the line. "Larry," the Rhino said at last, "you remember that saying about 'not only is the universe stranger than we imagine it's stranger than we *can* imagine?' "

Larry leaned forward eagerly. "Yeah?"

"Well," Rhine drawled, "it's even stranger than that." With that he hung up.

All over Jupiter, High Folk were arranging themselves along the track of the eclipse, guided by the ancient songs of prediction. An eclipse, a Gathering at moonshadow, a place for pods to meet and celebrate their world as they knew it. Every place the moon's shadow touched there

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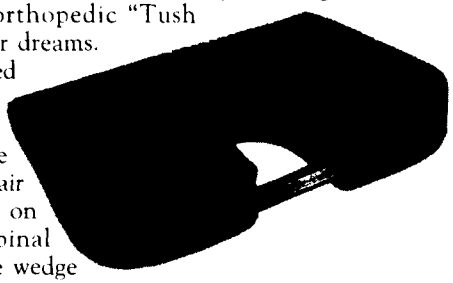

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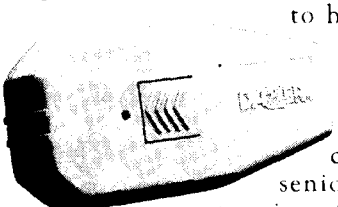

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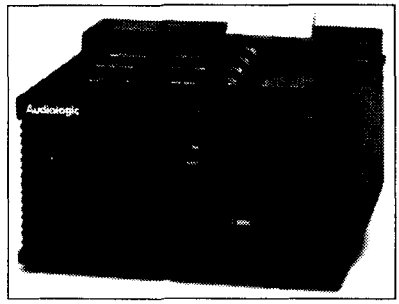

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would be High Folk beneath it to sing songs of welcome and praise. The inhabitants of Jupiter's cloud tops couldn't be said to worship the eclipse, but the mood came close.

Even from as high as he could comfortably fly, Ensign saw an endless river of High Folk, stretching from horizon to horizon along the path the moon's shadow would take across the tops of the clouds. Though widely separated, they were tightly packed by the standards of the free-living High Folk. There were pods and family groups, and here and there a lone yearling or two cavorting above the clouds, temporarily safe from sharks.

Just like home, Ensign thought to himself, and then sobered when he realized that this cloud band was his home now.

He turned his attention back to his guests—senior pod leaders—older, puffier, and ill at ease this high. In the anarchic society of the High Folk this was as close to a government as you got, and right now they wanted his assurance.

"This is most unusual," the central old one hummed out for perhaps the twentieth time. "Most unusual indeed."

"I agree it is different," Ensign said, "but I'm sure you will find it most satisfactory."

That was putting it mildly. Ensign, Melody, The Geek, and even Snow had labored through the months since the Sky Seed—composing, arranging, polishing, testing new harmonies, tearing out part of what they had so painstakingly crafted and recomposing to produce what might be the Bach Choir's master work.

"Has everyone received the song?" he asked.

"The remoras have been traded all through the band," wheezed the oldster on the left. He was ancient enough that he had trouble controlling his gas cells and hence his shape. It could not be comfortable for him to be this high and Ensign was sure his membranes, inelastic with age, were being stretched painfully.

"Then it waits only the eclipse to begin," Ensign told them. With his rear eyes he checked out the rest of his pod, clustered tightly and ready to begin their chase across the sky.

"Still," the central oldster went on, "this is so, so different. Is this some Southern fashion?"

Ensign rippled his trailing edge in a manner that indicated non-specific agreement. "Somewhat."

Snow bobbed to look skyward with her main eyes. "We have perhaps one more day-tenth," she sang out, "a little less perhaps."

Ensign rippled agreement. In the weeks since she had joined them Snow had become surprisingly adept at the songs of prediction. That had been an important factor in the honor accorded them of leading all the pods in their new Song of Gathering.

All of the pods. Unlike most performance pieces this one had a chorus for all the celebrants at the gathering to join in. A most unusual chorus.

If their voices were not what they had been, the Bach Choir's musical inventiveness was as great as ever. And they had labored over this song

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like nothing they had ever written before.

"We are ready then." He bobbed respect to the elderly delegation. "If you will excuse me I must join my choir."

Still muttering dubiously about these new innovations, but sighing with relief, the elders slid down toward the cloud tops to join their pods.

"Show time," Ensign sang quietly to his pod mates. "Let's make it good." The others bobbed agreement and clustered around Ensign, humming, buzzing, droning and chiming as they tested their many voices and tuned their membranes to each other. Underneath it all came Snow's metronome beat, counting down to the moment of eclipse.

"Threetwoone NOW," and with that the Bach Choir tightened their membranes and burst out in the "Welcoming Song For Moonshadow."

The first three phrases were for the Choir alone. Then, exactly on cue, the multitude spread out below them belled up in their part of the song.

Wingtip to wingtip, singing for all they were worth, the Bach Choir turned as one and began to race along the shadow's path just as the first bit of the Sun began to dim. Below, the massed High Folk added their part to the great welling of sound.

Melody and Snow wove over and under each other on the high parts. The Geek and Ensign took the middle registers. The effect was somewhat odd. Most choirs had twice as many members as were left to the Bach Choir and had a better balance of voices. The quartet was especially weak in the low registers, a fact which the chorus helped to mask. Still it was impressive. Ensign felt a thrill as they glided above the singing masses, listening to them add their weight to the song.

And the sky went BZZZHMMbeepbeepbeepbeep, chorused the rest of the Gathering.

And the sky went BZZZHMMbeepbeepbeepbeep.

Although the idea of "singing" with the tingle sense was completely unfamiliar to the High Folk, they picked it up readily, singing the part just as the remoras had given it to them, down to the modulations in the tingle sense. They were aided by the fact that the part for the tingle sense was extremely simple, just turning the signal on and off at intervals.

The High Folk were experts at synchronizing their actions, even over distances where time delays became perceptible. The resulting song wasn't perfectly in step, but it wasn't far off either.

Individually the High Folk could radiate very little energy, a fraction of a milliwatt each. But there were thousands of them all along the path of the eclipse in this band. Together it was enough.

The Bach Choir chased the moonshadow as far as they could, singing all the while. But eventually it outran them and left them in the clear sunlight, surrounded by a congratulatory

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mob of High Folk.

"Magnificent performance," an elder bubbled, surprisingly strong in the high registers. "I've never heard anything like it."

"It was the chorus," Ensign thrummed modestly. "It was all the High Folk together."

The Geek sidled close through the congratulatory throng.

"Now what?" he asked on a high, tight beam that only Ensign could hear.

Ensign continued to respond to the flood of congratulations, but he bobbed his body so his main eyes were focused directly skyward. "Now," he beamed to The Geek, "it is up to the others." *If there are others.*

"Gary, this is Ed Steveberg at the VLA."

"Hey, Ed, How's life in New Mexico?" F. Gary Rhine swung his feet up on the desk and switched the phone to his other ear.

He could almost hear the VLA radio engineer's frown. "Interesting—as in the ancient Chinese curse."

Rhine chuckled. "Yah, we still haven't made any progress on the Probe. Still looks like it stopped moving downward and something blocked its signals."

Steveberg's laugh sounded more like a bark. "That's last month's mystery. I've got a new little mystery for you. We aimed the antenna array at the orbiter yesterday to get a precision Doppler hack on it before the next orbital change maneuver."

"Yeah?"

"Well, we got two signals back!"

Rhine thought for a moment. "Multipath reflection of the Orbiter's transmission off some intervening surface like Jupiter's rings?"

"Our first thought, but the weaker signal isn't from the Orbiter—it's from the probe!"

Gary didn't say anything for a moment. A long moment. "The probe—the atmospheric probe?"

"The one and only! It has the framing pattern of radio data transmissions."

"Um, the batteries were only good for a couple of hours."

"Yep. And it gets curiouser and curiouser. I took a Doppler reading on the probe frequency and, over a period of several minutes, looked at motion at right angles to the beam."

Rhine warmed to the analysis, "You're assuming that the signal originates at or near the cloud tops. . . ."

"That's where we left it. Anyway, I got an accurate solution and can you guess what happened at that latitude and longitude just about the time the signals started?"

"I bet I'm about to find out."

"The largest and longest solar eclipse as seen from Jupiter by the Galilean Moon Europa was going on right there!"

"Um, Ed, is that supposed to have some significance for me? I'm not much of a planetary scientist."

Steveberg laughed. "No, I just thought I'd brighten your otherwise mundane existence with a Class One Enigma."

Rhine shied away from the mysterious part of the problem and attacked the one area of his specialty, "Have you

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decoded the probe's signals?"

"So far, all we went for were the Doppler and position. We'll let you know as soon as we have something."

"Well, don't diddle around with channels. Shoot me something as soon as you've got it, OK?"

"E-mail coming up," Steveberg promised and then hung up.

Rhine hung up the phone slowly. For a long time he sat staring into his desk blotter as if deciphering the random ink stains and doodles.

Steveberg was even better than his word. Two days later he flew in from New Mexico with an attache case stuffed with data disks and printouts. He, Rhine, and the other members of the communications team spent several days going over them.

Their conclusions were surprisingly inconclusive.

"You know what's wrong with this mess?" Rhine asked Steveberg over coffee in the cafeteria late in the afternoon of the second day.

"Yeah, it's a mess."

"Bullshit," Rhine said without heat. "It's what's here and what's not here. What's here is the framing for the probe signal. That's dead-nuts perfect. But what's inside those frames is gibberish."

"You mean noise?"

"No, gibberish. Noise is random. This stuff isn't random, it just doesn't make any sense."

At the next table Suzanne Quinlan concentrated on her diet soda and tried very hard not to listen in.

"Distortion?"

Rhine cocked an eyebrow. "Which leaves the framing untouched?"

"Maybe there's some kind of delay line down in the atmosphere that's kept the signal echoing all this time."

The Rhino snorted.

"Think about it," Steveberg persisted, "If that's what's happening you'd expect the parts of the signal that are constant, the framing, to be the most perfect because it's the most often repeated. The other stuff, the contents, is more variable so it would be more likely to be scrambled. If you look you'll see even the framing is a little fuzzy."

"So what the hell is down there that acts like a delay line?"

"We don't know yet. If it's a point source it's fairly far down into the atmosphere. Who knows what kind of weird structures are in there?"

"What if it's coming from the cloud tops?" The Rhino interjected.

Steveberg thought for a minute. "Best thinking at the VLA is that it isn't. If it was at the cloud tops it's not a point source, more like a band following the shadow of the eclipse. Why?"

"Because that deep in the atmosphere you're not likely to get any effect from the eclipse. You would on the cloud tops."

"But that means you've got a radio source several thousand kilometers long on top of the clouds."

"Anyway," he went on, "it's not true that you won't get an effect from the eclipse down in the clouds. There are probably tidal effects, for example."

The Rhino didn't reply, but he didn't look happy either.

E. Gary Rhine stayed late in his office that night, going over the data

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and fighting a growing conclusion.

"Oh shit," he implored Murphy and whatever other deities might exist. "Don't do this to me! In a few months I can retire. I'm too old for this."

He recalled the debacle when British radio astronomers detected regular radio pulses. No, it wasn't a message from Little Green Men, just an unknown astrophysical phenomenon.

Maybe some fool was spoofing him. It looked like one of those signal processing exercises where the instructors deliberately blanked part of the message. But if so it was a very elaborate spoof. In the weeks since the probe he had obtained originals of the data from all the observing stations and gone over it bit by bit.

Well hell, he wasn't an astrophysicist. Let them explain it. Meanwhile, he only had a few more months until retirement. His windmill tilting days were well behind him.

Somehow that wasn't comforting.

Suzanne Quinlan sipped coffee in her postage-stamp balcony and looked out over the parking lot to the brown hills beyond. It was twilight, but not dark enough to see the stars yet, and Jupiter wouldn't rise for a while.

Something had happened out there. Something important, she knew, but what? What could possibly have caused the probe to act in that way?

The Rhino was right. This new signal wasn't random, but it was gibberish, something that didn't quite make sense, like a child's babbling attempt to imitate his elder's speech.

That led her back to the thought she'd been avoiding all day. What if there was some kind of purpose behind the repeat? Something out there to send the signal back?

Neat theory, it explained everything. It was also crazy. Suzanne had grown up reading science fiction. She had vicariously contacted a thousand alien races and now maybe, just maybe, she actually stood on the threshold of acting out her wildest dreams. The idea was so attractive she knew it *had* to be wrong.

It was also dangerous. She was in no position to advance a theory like that. She had no standing, no credibility and no tenure to protect her.

By nature Suzanne Quinlan was not confrontational. In graduate school she had perfected the fine art of getting along by going along, and above all by keeping her head down and avoiding negatives.

"If I even mention the possibility they'll say it's stress and send me home," she muttered. After that she'd be lucky to get a job teaching astronomy at a junior college. Or maybe she could get a job on one of those TV astrology hotlines, foretelling the future on the basis of the voices from the stars.

She set the coffee cup down and realized she was hot and sticky from the smog and late afternoon Sun. A shower could take care of that, but nothing she knew could deal with the little itch that was growing in her brain.

"God, I love this job!" she muttered

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as he headed for the shower.

Another day, thought Suzanne Quinlan, *another meeting.*

The Anomaly Committee, as it was universally known, had been meeting regularly for months now, and rather to her initial surprise, Suzanne had found herself representing her group on it.

By now she understood perfectly well what was going on. The committee was purely symbolic—a collection of scapegoats designed to appease the eventual wrath of The Powers That Be. The probe was a failure and the politically skilled were disassociating themselves from the project before that sank in. The men and women at the very top were too closely connected to the project to have that luxury, and the people on the front line were too committed to disown their child. But at the middle and lower levels managers were oozing away like jellyfish, sucking the greenhorns and the lower level people in to fill the void. Clearly this was not going to be a shining spot on any one's resume, especially the ones holding the ball when the news really broke.

For the principal investigators and the others at the top, it didn't much matter. Their reputations could stand the strain and many of them were near retirement anyway . But the middle-level and lower people were a different story. Associating with the data analysis of the Jupiter probe might mean they'd end up teaching astronomy at the high school level. After weeks of being stuck in these meetings there was a part of Suzanne Quinlan that couldn't see that as a bad thing.

Suzanne had found herself spending an average of one afternoon a week in a conference room with a collection of the old, the weak, the outmaneuvered, and the expendable. Although there were no place cards, they were ranked around the table by status with Dr. Smith, the chairman, at the head, flanked by Dr. Lewis and Prof. Van Meurs, and sifting down from there.

Down at the foot of the table, next to Suzanne Quinlan, sat F. Gary Rhine, in case someone wanted some details about the communications network. So far no one had.

As the committee members settled in, Suzanne concentrated on the scheduling data in the folder before her. There was nothing new there, but then there hadn't been anything new in the last couple of weeks from anyone. They were simply going through the forms and everyone knew it. She noticed that perhaps one-third of the committee members were absent and damned the Catholic conscience that drove her to attend these stupid useless meetings.

After a few preliminaries, Dr. Smith opened the meeting for comments.

"The most likely hypothesis still appears to be a transmitter malfunction," Dr. Lewis said carefully.

The temperature in the room dropped a good ten degrees. "We cannot model any likely failure mode that reproduces the characteristics," Van Meurs said frostily.

"What about the echoed signal?"

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someone else asked.

"We have several theories that might account for that," said Dr. Portajee, "including the possibility that something rather like an organic semiconductor is formed in Jupiter's atmosphere at certain levels."

Smith pursed his lips. "Speculative," he pronounced.

"Our computer simulations show—" Portajee began.

"Boundary conditions," someone further down the table murmured.

"I move we establish a sub-committee to examine the question," said Wilson.

"You mean a sub-sub-committee," someone else said. "Logically it should fall under the atmospherics committee."

"But a separate sub-committee—"

"Boundary conditions. What were the simulation's boundary conditions?"

"Information theory suggests—"

"Life," someone said loudly.

Every one stopped and stared at the foot of the table. In horror Suzanne realized the voice had been hers. Instead of muttering it under her breath she had said it out loud.

"Yes, ah, Mzz Quinlan?" Dr. Smith said.

Suzanne Quinlan took a deep breath. "Life. Intelligent life in the clouds of Jupiter."

There was a long strained silence. Dr. Smith stared down at his notepad. Dr. Lewis licked his lips and concentrated on the ceiling tiles. Van Meurs mumbled something under his breath. Through the silence Suzanne could hear her career splintering and crashing down around her ears. Any instant now one of these men would open his mouth and her Ph.D wouldn't be worth the paper it was printed on.

"She's right, you know," came a quiet voice at her elbow.

"Eh?" Dr. Smith's eyes jerked down the table to rest on F. Gary Rhine.

"I said she's right. The best explanation for the data we've got is that there is intelligent life on Jupiter that intercepted the probe and is trying to communicate with us."

"Isn't that a rather extreme conclusion to draw from the communications glitch?" Lewis asked in a carefully neutral tone.

"It's not a glitch."

He ticked off the points on his fingers:

"Something intercepted the probe at the cloud tops and held it there at least until the batteries ran down and it stopped transmitting. Something interfered with the signal at irregular intervals by moving between the transmitter and *Galileo*. Then, at an eclipse of Europa, we've got the signal shot back to us. Deliberately sent back."

"Analysis indicates the signal is probably random," said Van Meurs frostily.

Rhine's smile was almost satanic. "Yeah, but the framing bits aren't. Whatever it is duplicated our packet structure. Only you didn't see that because the packets had been stripped off before you were given the data to analyze."

"But the contents were not duplicated," Van Meurs said.

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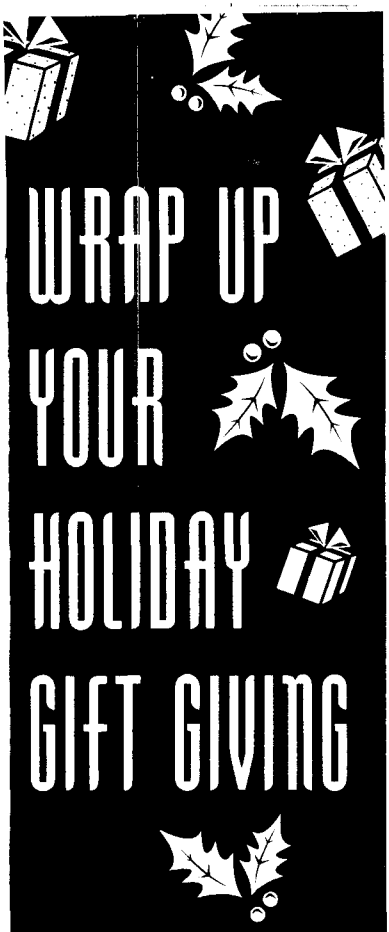

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"Nope, not the content. That changed almost frame to frame while the probe was sending and they probably didn't understand it. So they sent values in the observed ranges in there."

"That takes a fantastic coincidence, that something would be on hand to catch it."

"Not as much as you think. There's the probe, floating down like a big fishing lure, it's going to attract anything curious for hundreds of miles around. Hell, for all we know something snapped it up like a trout on a fly." He shrugged. "That doesn't matter. The important thing is, it's life, it's intelligent and it wants to say 'howdy.' "

He scanned their faces. "Oh, don't look so shocked. People have been playing with the idea for decades. Hell, there have even been science fiction stories written around it. Arthur C. Clarke did one years ago." He grinned ironically. "As well as some more respectable speculation."

He glared around the room. "The problem with you damn people is you never talk to each other. This whole damn place is organized like a protocol stack with every layer a black box to all the other damn layers.

"You," he pointed to Van Meurs, "knew all about the flight profile. You," he pointed to Lewis, "knew about the echo. But you don't talk except at these damn meetings so you never put it together." He jerked a nod at Suzanne. "She talks to everyone so she figured it out."

Smith dug frantically through the printouts.

"But why wait until the eclipse? And why along the path?"

Rhine shrugged. "Ask me again in a couple of years. We'll know more then."

"Gentlemen," Smith announced, "do you realize what this means? It's the biggest boost for planetary science in the history of space exploration. Why, why, it'll easily triple our budgets!"

Van Meurs pursed his lips. "If it's real."

"For the moment let us proceed as if the phenomenon is real," Dr. Smith said magisterially. "Why, the possibilities are," his eyes shone at the thought of all that money, "mind-boggling."

Suzanne's head had been swiveling between the participants like a spectator at a tennis match. Rhine touched her shoulder and motioned toward the door. Unnoticed, the pair left the conference room. As they slipped out the door one of the participants was using his putative status on the new project to demand a reserved parking space.

"Shouldn't we have stayed?" Suzanne asked as the noise faded behind them. "I mean, they might have more questions."

"They're beyond fact gathering. Now they're down to the part that really interests them—how they can make the most out of this. They'll be arguing about how to spin this until sometime tomorrow morning."

"But suppose they decide there's nothing to it after all?"

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Rhine grinned a particularly nasty grin. "It doesn't matter. By this time tomorrow it will be out on the Internet and all over the world." The grin got even broader and Suzanne developed a sneaking suspicion who the first person to post the news would be. "Hell, woman! How much equipment do you think it takes to get a radio signal to Jupiter? Or hear one coming back? Hams all over the world will set the stuff up in their backyards and every one will be able to hear the results."

"But what about them?" She tossed her head toward the conference room they had just left.

"They're irrelevant, but don't tell them just yet. No reason to hurt their feelings. Meanwhile, I've got a friend I want you to meet. A guy by the name of Ed Steveberg in the VLA group. We've got us a SETI program to map out. Oh yeah, and there's another guy, Larry Collins, you should probably talk to pretty soon." F. Gary Rhine threw a companionable arm around Dr. Suzanne Quinlan's shoulders. She saw there were tears in his eyes. "God!" he roared down the empty corridor, "I love this job!" ■

EDITOR'S NOTE: *This story is a sequel to "Symphony For Skyfall," in our July 1994 issue.*

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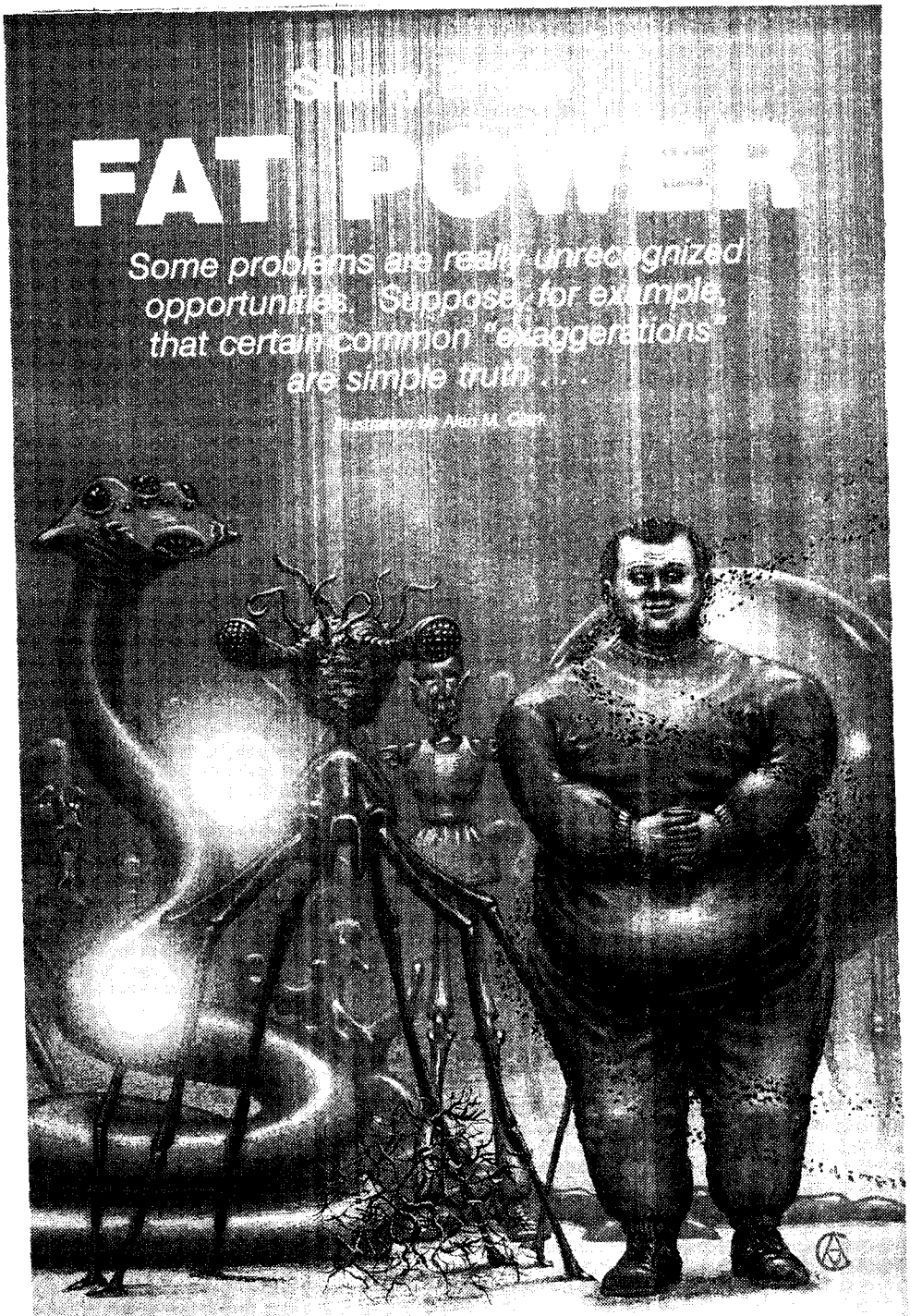
FAT POWER

Some problems are really unrecognized opportunities. Suppose, for example, that certain common "exaggerations" are simple truth . . .

Illustrated by Alan M. Clark



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Ron Corcoran had been good about his diet. Sitting glumly at the Workshop for Fitness meeting, he reflected on the broad sweep of Terran history, and how events had conspired to make his own life uniquely unbearable. Life since the mid-twentieth century had never been all that easy for those who tend to roundness of figure, but it had never been worse than now. Ron huddled, brooding, within his own personal singularity of misery.

The late twentieth century had seen a progressive obsession with the ideal of a tall, willowy figure. Things had been bad enough then, Ron thought. Then the Galactics came.

The actual arrival of the aliens could hardly have been more soul satisfying. One fine day every television set, radio, Telex terminal, personal computer, telephone, automatic teller and video game machine ceased its normal order of business.

In Omaha, Nebraska, a small boy had been engaged in the ticklish procedure of persuading the school computer to change his gym grade to a bare pass. Suddenly, he yelped and rushed downstairs to his parents, shrieking "Totally Awesome!" at the top of his lungs.

In Burbank, California, a harried mom stared at the cash machine. She desperately clutched the hand of a restless two-year-old who was giving every indication of being about to explore his overripe diaper with grubby, ever curious fingers. Tight-lipped, she thought bitter thoughts about the apparently anonymous, thoughtless prankster whose trick gave every promise of causing a half-baked headache to blossom forth into a truly magnificent migraine.

As harbingers of impending total change go the small slip of paper, printed in slightly uneven dot matrix characters, was not of itself particularly impressive. The fact that it had emerged from Ron's hand-held calculator, which ran on batteries and was designed to produce nothing but numbers, was.

The message it bore was clear, and ran as follows:

TO THE PEOPLE OF EARTH:

WELCOME TO THE GALACTIC FEDERATION. WE ARE PLEASED THAT YOU HAVE CHOSEN TO JOIN US. REPRESENTATIVES OF THE GALACTIC FEDERATION CIVILIZATIONS WILL APPEAR THROUGHOUT YOUR PLANET DURING THE NEXT WEEK. THEY WILL BRING YOU FURTHER INFORMATION TO ENABLE YOU TO JOIN SMOOTHLY WITH GALACTIC SOCIETY. THANK YOU. WE LOOK FORWARD TO A NEW ERA OF DEVELOPING HARMONY.

Initial panic among the journalists and intellectuals of the newly admitted planet faded into amazed relief as the Galactics's terms were made clear. No science fiction nightmares occurred, and local customs were left undisturbed. The disapproval of various cultures continued unabated, and in fact seemed to increase, as newspaper budgets grew.

Almost unnoticed amid the apparent divisiveness was the fact that actual violence diminished drastically. Although wars continued, they consisted mostly of large-scale troop

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movements and propaganda. Former combat hospitals became important in the war against local disease, and a new sense of hope arose in the local populations, who benefited greatly by the new Galactic medical technology.

The aliens themselves had a vast number of shapes, sizes, environmental requirements, sexes, eating habits, family structures, ranking systems, mental organizations, and communication modes. Sound-wave utilizing, highly visual (within one octave), bilaterally symmetrical, two-sexed Terrans had a huge first lesson in form acceptance dumped on them all at once. Prejudice flared briefly, and then died, overwhelmed by an array of new sensory impressions never before equalled. People who hated bugs learned to endure the /klik. These louse-sized entities swarmed over whatever they were investigating, often making it look like a mound of crawling iridescent black. Snake-haters met the smooth, lithe Srendekians, and spider smashers learned to work with the many arachnoids in the Federation. Green slime, tumbleweeds, ball lightning, metallic spheres who snapped like a string of firecrackers when they talked, and hundreds more appeared. Terrans were startled and horrified. Ultimately, they learned to accept their new colleagues.

Ron thought bitterly of the many forms which had become accepted, and the one oppressive exception. The entities who arrived had one thing in common: top physical fitness. Ron had no way of knowing how to tell a slim spherical entity from a fat one, or a flabby collectively intelligent swarm from one that was trim, but he was assured that skinniness was the norm among all of the various new arrivals

As Galactic knowledge spread, prosperity advanced into the poorest areas. Material want became a historical curiosity that children struggled, with no great interest, to understand in school. The various Galactic species were generous with their technology and unobtrusive with any cultural requirements, but one thing became ever clearer. Aside from inexpensive travel within the Solar System, and Galactic-sponsored Terraforming projects on both Mars and Venus, space travel was not generally available. What made it hard to bear was the fact that a star drive was obviously used throughout the Galaxy, and was commonplace among the swarms of diverse visitors. All of them, from kids trying out a new space-yacht bestowed by indulgent members of the previous generation, to the proud captains of mighty starships, were equally, infuriatingly silent on the subject of the star drive itself.

It became excruciatingly clear that unless Earth technology developed the solution independently, Terrans would never reach the stars. Ron had garnered his highly desirable position at the University of Terra by his deep knowledge of physics. Not surprisingly, a vast Space Drive project had grown up on Earth, and Physics was one of the most hotly pursued fields of study. The funding available for this project was of a magnitude not even imaginable in earlier, pre-Galactic

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times. U. of T. was the nexus point for this planet-wide effort.

The effort would not have been so frantic if Terrans had been able to ride on any one of the myriad star drive vehicles which swarmed so tantalizingly. Such opportunities proved strictly limited, however. The few Terrans fortunate enough to visit other civilizations were invited on occasions so obviously ceremonial, and the destinations they were permitted to see so carefully prepared, that such contacts simply added fuel to the already raging fire of Terran curiosity. While the Galactics did nothing direct to aid Terran star drive research, they did take a persistent, slightly amused interest in Terran efforts.

Ron was glad that his considerable ability in physics had been sufficient to overcome any prejudice he might have suffered by his unfortunate tendency to gain weight, often with no apparent reason, but at the moment, listening to the stringy lecturer, he took small comfort in that fact. She had lost 150 pounds through the Workshop for Slimness program, had kept it off, and was up in front of an audience representing several tons of accumulated lard to assure them that they, too, could do the same.

All week, Ron had kept strictly to the prescribed diet, eschewing anything with any taste. The week had not been without its trials. He had gone to his cousin's wedding, and exasperated his generous hosts by spurning all of the goodies on which both families had labored for days. He sipped primly at black coffee with no sugar, and nibbled at one tiny watercress sandwich. The wine, beer, brownies, petit fours, éclairs, quiches and myriad other temptations were stoically, if not easily, ignored. To add to the fun, he had caused what promised to be a serious breach within the family by refusing champagne for the toast.

Then there was the time he had lunched with Dr. Biddle, his department chairman. On this occasion he got to watch, and smell, as Dr. Biddle tucked into his lean frame two mugs of dark draft beer, a huge liverwurst sandwich on rye, french fries with extra butter melted over them, and a dessert too obscene to mention. Ron had munched sadly on a salad with plain vinegar for dressing, black tea, and one small scoop of lo-fat cottage cheese.

So it went, throughout the week. He had gone to bed with a growling stomach, awakening after poor sleep to a vast emptiness and the prospect of dry toast choked down with black coffee. What was his reward for suffering these torments? Confidently plopping his ample rear into his seat, he was shocked to see that he had gained five pounds.

Real cute, those seats, Ron thought bitterly. Like so much in life, now, they were in large part a product of Galactic technology. The seats utilized a direct mass sensor, independent of local gravity. As the unhappy dieter sat down, an almost imperceptible jerk took place, and the victim's weight appeared on the readout. Should he have cared to know, Ron, by touching a few more buttons, could have seen what he weighed in

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the units and gravities of a few hundred of the more local Galactic planets.

This had amused him the first few times he had attended these sessions, but now Ron glared at the readout panel. If weight loss was so damned important, why the hell couldn't the aliens have developed some reasonable way of dealing with it? He failed to see why it was so important, anyway. Galactic medicine ensured that he didn't need to fear the high blood pressure or cardiovascular problems associated in the past with obesity. The problem was social. The unreasonable prejudice against fat had become magnified when Terrans became exposed to the slim, trim Galactics. The one which annoyed Ron the most was something which looked like a huge sac filled with transparent slime. Terrans were told that its very transparency was due to the fact that internal fat globules were practically non-existent.

The skinny reformed fatso in charge didn't say anything when she saw the readout. Her look said enough. No sympathy for evidence of what she could only view as regrettably weak character. Now Ron, wounded to the core, sadly reviewed a week of pointless virtue. Patiently, he sifted through his memory for every gram he had consumed during the past week. This wasn't hard. Meals had been few, scant, and desperately needed. Suddenly, he remembered a smell. Chocolate—a rich, warm aroma. A brownie, exactly one inch by one inch.

It hadn't been much of a straying from the narrow path, but it had been enough. The week before, he had eaten nothing untoward. He hadn't gained, but he hadn't lost, either. Before that: one can of beer. That had cost four pounds. And so on. Ron reflected on his high hopes when he had started the program, under the urging of Dr. Biddle.

Dr. Biddle, Ron's department head, was a fitness nut even by the stringent standards of these times. When Ron joined T. U., he learned that he was expected at least to try for Biddle's level of physical perfection. Ron never had a chance. Biddle was one of those wiry perpetual motion machines that ate constantly and never gained a pound. Following Biddle's rather pointed recommendations, Ron had joined the Slimness Workshop, as well as starting several physical activities. He bought a bike, and even attempted to ride the thing. He joined the Terran University bowling league, where he held all in awe at the meagerness of his scores. He tried. Oh, how he tried! It soon became evident that physical culture in any form was not his forte.

Ron reviewed all of the weeks of virtue and suffering, counting every miserable calorie of intake, and balancing this against his impressive weight gains. Suddenly, the germ of a wildly improbable idea began to form. He was too good a scientist to miss the implications of data all too easily available to him. Anomalies he had started to experience in his own research began to shift in his mind, clicking into place like pieces of a giant jigsaw puzzle. Trembling, he

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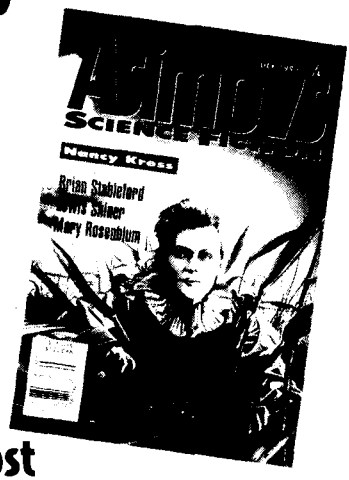

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turned to the ample woman sitting next to him, and clutched her arm.

"Alice!" he whispered. "I've just thought of something! Let's get out of here! We've got work to do!"

Alice Geery was Ron's best friend, fully as massive, mentally as well as physically, as he. Her specialty was biochemistry, but she possessed a flair for physics. She was engaged in the newly expanding field of teasing out some of the basic physics of biochemical reactions. Lately she had been concentrating on some of the apparent impossibilities which were coming to light, mostly in the area of energy conservation. It took her no time to read and understand the urgency behind Ron's interruption, and soon two large, self-conscious individuals were sneaking conspicuously from the meeting.

"OK, Ron." Alice said, uncomfortably aware of the disapproving stare of the Slimness instructor. "We left the meeting. Now, what did you want to talk about that's so important it can't wait?"

"Alice, I think I have it!" Ron said. "You are just the person I need to help me get to the bottom of this!"

Alice remained unenlightened. "Ron, what on Earth are you talking about?"

"Not Earth, Alice! The whole damn Galaxy!"

"What?!"

"All that fat. Alice, do you know how hard we've been trying to lose weight?"

"Of course." She replied, sardonically. "How could I miss that slight detail?" Alice had been seen absentmindedly nibbling her lunch bag during department softball games.

"And all those blasted aliens in form-fitting uniforms. Each wretched beastie at the absolute peak of physical perfection. Do you have any idea how we'd look in those things? But, you know, my idea has to do with that very thing."

Alice was giving him her very worst "Oh-no-what-a flake" expression, but Ron continued undeterred.

"Listen, Alice, I've been thinking, and reviewing my intake and weight gain. Look, we're both scientists. Recently, Terrans have been rabid on the subject of weight loss. That's what has blinded us to the truth. If you think about it, this obsession with losing weight is completely illogical. It just doesn't make sense."

Rendered speechless by his overbearing earnestness, Alice continued to listen.

"Look at the data. One lousy one-inch-square brownie causing me to gain five pounds. Your initial loss wiped out by one stinking Oreo. We've even set up tripwires between our beds and the refrigerator to rule out sleepwalking. What did that get us? Zip. Zilch. Nothing at all. Alice, we haven't been sleepwalking, or doing anything else which would cause us to eat without knowing it."

Alice Geery was skeptical, but she was too much of a scientist to ignore evidence, no matter how improbable, when it was held up in front of her. Slowly, she shook her head.

"You know, Ron, I hate to admit it. It goes against everything we've ever learned about the laws of physics, but

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I see your point. I thought that I was in error somewhere, and was trying so hard to disprove what I've been seeing that I didn't even see what it was."

"A few laws?" Ron said. "Try conservation of matter and energy, or the laws of thermodynamics."

"One miserable cookie going to four pounds of fat??!"

"All that virtue—"

"Running our bodies on nothing—"

"Or next to nothing—"

"And *gaining!*"

"Something for nothing!"

Slowly, two overweight scientists turned to stare at each other, as the implications of what they were saying moved slowly into full mental view. In the late twentieth century people had became obsessed with diet and fitness. As the cost of medical care soared and life spans increased, people began to do what they could to cut doctors' bills. By the twenty-first century, naturally rotund individuals found themselves under ever more unbearable social pressure. Slimness-obsessed Terrans were propelled into full mania by the arrival of the sleek, trim aliens. The prosperity which those aliens brought allowed even people subsisting in historically famine-afflicted areas the possibility of a good diet, and the money to spend on the "lite" foods needed to trim back to near famine. In the ensuing orgy of guilt several rather nasty tasting "healthy" foods became best sellers, while the manufacture of chocolate was almost stopped entirely.

That same guilt had blinded Ron and Alice to the startling things of which their own bodies were capable, but now they saw clearly the direction their research needed to pursue. The initial work confirmed their ideas. The next two months saw the pair working late into the night on their own time. Finally, they were ready to approach Dr. Biddle.

The night before the momentous, and certainly dreaded, confrontation with the department chairman, they were holding a last minute council of war in a secluded corner of their favorite bar. Anyone who had noticed what they had in front of them might have raised startled eyebrows at what they had ordered: dark beer on draft, potato skins drenched with melted cheese, and a generous bowl of salted nuts. The two hard working researchers would not have cared. They had reason to celebrate.

"Well, Ron, this is it. Tomorrow, we beard the lion in his own den."

"Alice, I tell you, we can't miss. The guy might be a class A pain in the ass, but he *is* a good scientist. He may not like what we are doing to some of his pet theories, but he has no choice but to support our research if he wants any part of the new star drive."

His enthusiasm was infectious. Alice's eyes crinkled with pleasure, and beer mugs clinked. No fine champagne glasses ever sounded sweeter.

In the harsh light of morning a bit of the victorious glow had faded. Two somewhat rumpled, slightly hungover scientists walked slowly up the long, wood paneled corridor leading to the very center of power of the most prestigious department of the

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greatest university on the face of the Earth. They were painfully aware of the slightly uncrisp nature of their best suits, and the unmistakably battered appearance of their economy model briefcases. The huge, polished mahogany doors, with their gleaming brass handles, swung open smoothly, with the silence indicative of assiduous maintenance. Disdaining a receptionist, Biddle himself sat at a huge desk, facing them impassively. He allowed the silence to continue until Ron grew slightly pink. Then he spoke.

"Well, you said you had some data for me. Let me see them."

"Yes, sir. Here are our initial results, along with the raw data."

Alice spoke with crisp authority which belied her appearance, and arranged several papers on the desk. Biddle's eyebrows rose. He regarded the pair thoughtfully, and then leaned forward to examine the papers spread out before him. After a long silence, he spoke.

"These data are hardly expected, but you do seem to be onto something. Where do you plan to go from here?"

Unhesitatingly, Alice replied.

"The next step is to set up experiments on living organisms. The Galactic technology, combined with Terran Fuzzy Logic and Chaos Theory, are pretty powerful tools, but even so, we've gone as far as we can with computer simulations."

"Virtual rats, I suppose?"

"Virtual humans, with full scan data taken from both of us."

Biddle was impressed. That glib phrase was enough to let him know that both researchers had endured a full week of Galactic probing throughout their bodies, with extensive tissue sampling. He listened carefully as they continued.

"Perhaps we could do some preliminary studies on rats, but we really need to do most of our work with primates. The greatest disparities between intake and output, in fact, seem to occur in humans." Biddle wasn't too happy about the implications of their work, but, as Ron had said, he was too careful a scientist to dismiss it out of hand. Nevertheless, he brooded. He couldn't help hoping that the figures Ron and Alice had shown would turn out to be a dead end. It would be hard to let go of his cherished idea that slimness equals virtue.

Ron and Alice worked well together, which did much to help their tempers, despite the fact that they ran chronically short on sleep. The precision of Alice's mind in dealing with the delicate interrelationships involved at the heart of biochemical reactions, added to Ron's driving enthusiasm and deep knowledge of physics, brought them to the core of the issues with which they were dealing.

The Galactics took such an interest in their research that the pair were finally obliged to put firm Do Not Disturb signs on the lab door. The aliens were never intentionally obstructive, but too many could crowd Ron and Alice out of the room entirely. When the lab doors were locked they were mostly undisturbed, but had to accept the fact that the /klik, too small to be

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kept out, were going to be with them. At critical junctures in the research the two scientists were coated with tiny, jostling insects. At first barely endured, the /klik came to be welcome evidence that their research was going in the right direction. Ron and Alice realized that by their very interest the /klik were at long last giving hints no Terran had ever received from the inscrutable Galactics. The hints were helpful, but it was not easy to work covered completely by tiny black bugs.

Ron and Alice also ate only sporadically, so immersed in their work that food didn't interest them. To add to mealtime complications, they were frequently in danger of ingesting several eager /klik. Despite official Hive assurances about individual unimportance, dining, however inadvertently, on sentient entities did not appeal. A new pattern of picky eating emerged. Over the next year, they gained a mere five pounds each.

At the end of the year, the theory was complete. A committee of Galactics was formed to review current research. Grant money suddenly flooded in from Galactic sources. At the end of the second year, the starship was complete. If Biddle had truly understood the sums of money being spent he would have had a fit. As it was, he tolerated the Galactic takeover within the department, while using the prestige conferred by the Galactic interest to raise funds for other projects. He followed Ron and Alice's research in a general way, but was too busy to give detailed attention to the small starship they were building. After the ship was completed, Dr. Biddle, as nominal head of the project, was invited on board the vessel, named *Fat Power,* which would carry his highest aspirations to the stars.

Fat Power's hull was as smooth as Galactic technology would allow. To say she was mirrorlike was an understatement. Full subspace shields were evidenced by an iridescent shimmer over the entire hull. Alice and Ron had been a bit apprehensive about Dr. Biddle's reaction to the inside of the gleaming starship. This concern was well founded. Although by Galactic standards the craft was a modest, two person model, it did not match Terran ideas of what a spaceship should be. In addition to the spacious navigation and drive area, it boasted two comfortable staterooms, lavishly equipped galley, and a storeroom whose vastness had nearly caused open rebellion among the Terran engineers working on the ship.

Biddle looked around approvingly at the outside, with its flawlessly designed and machined airlock. A sticky silence fell when he surveyed the interior. He inspected the luxurious staterooms. He peered shudderingly into the entertainment area, paling when he saw the film library, holo equipment, and video game his department had funded. Ron proudly pointed out the computer and holovideo recording equipment.

"As you can see, Dr. Biddle, we will be able to provide first class records of our trips. Just think of what quality documentation will do for your reputation."

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At this, Dr. Biddle's color turned a sickly hue never yet seen on his healthy face. He said nothing. He goggled at the bathroom facilities, which would have done pride to one of the more dissolute Roman emperors. He stared about in horror, his worst fears realized. These two fat buffoons had made a fool of him. When this got out, his reputation would be gone, stripped off in a firestorm of ridicule. An uncomfortable silence fell.

"So this is it."

The words came out flat, carefully neutral.

"Yes, sir."

The only strange thing about the ship, apart from the fact that its lush comfort and extravagant areas violated every space and weight restriction which had been respected by ship builders since the first log rafts had been lashed together by adventurous early humans, was what Alice had named proudly as the Drive Chair. They were back in the control room, Dr. Biddle white and shaking, oblivious of the /klik that swarmed over him. He stared at the Drive Chair. Its evident adaptability for naps, and the all-too-handy snack tray, did little to improve his temper. The drive chair was not even a parody of things he had seen on other Terran ships; its only apparent purpose was to annoy Biddle. It succeeded.

"Well, Dr. Geery. This so-called drive chair. This is the fruit of all your research, the thing my department has been funding for the last two years?"

"Yes, sir." Alice said quietly, not bothering to point out that the main source of the funding had nothing to do with Dr. Biddle. "Oh, by the way, you might note the drive chair coupling. That is what links the space warping entity to the actual star drive."

"Ron," she continued, "let's show Dr. Biddle how it works."

Ron sat in the chair as Dr. Biddle, furious, glared at Alice, who continued calmly.

"Our research has uncovered the basic principle of the Galactic star drive, which appears to violate several known principles of physics. Our primary breakthrough was the recognition of the unusual metabolic characteristics of specially adapted entities. Such entities have been discovered among almost all Galactic populations, Terrans included."

"Just what do you think this is?" Biddle sputtered. "A joke?" His temper was not improved by the pair's visible, fat smugness.

"No sir. No joke. Ron and I just happen to be adapted entities."

As Dr. Biddle was talking to Alice, Ron, seated in the drive chair, hitched himself into the metabolic coupling system and made some silent adjustments. Now Dr. Biddle looked around and saw him. Biddle drew himself up, looking impressively wrathful.

"*Dr.* Corcoran." He said scathingly. "I trust that chair is comfortable enough."

Dr. Biddle had a way of using one's hard-earned title to express depths of contempt never imagined by those who have not given years of their life to earn it. Unruffled, Ron replied.

"Yes, sir."

Alice, who had moved quietly into

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the pilot's chair, began punching coordinates hurriedly into the navigation console. Unaware of her, Dr. Biddle continued.

"I'm glad you are comfortable. I see you are sitting, too, Dr. Geery. Perhaps it is just as well. You two are *fired!*"

For the first time, Ron and Alice were not prepared with a rehearsed answer. Alice finally found her voice.

"Ah, Dr. Biddle, um, you might need to talk to President Mariachi."

"Also, we have to finish out the term with our classes." Ron added.

Biddle, who had no previous experience with losing control, stared amazed at the two members of his staff. As he realized that he had spoken a favorite fantasy aloud, he sank into one of the other chairs.

"Dr. Biddle." Alice said, unconsciously ironic. "Please let us table this discussion for now. We have a job to do."

Dr. Biddle started, and then stared. Both Alice and Ron were pointing to the coordinate readout, which impossibly, perplexingly, showed the ship's position to be just outside the rings of Saturn. The image shifted disturbingly, clearing again to reveal a pattern of stars never seen from Earth. Dr. Biddle had expected that Ron and Alice would be the primates included in this experiment, but he hadn't expected himself to be included as well.

"I'll press charges just as soon as we return to Earth." Biddle began in tones of quiet menace. "Don't think you can run forever. You have just kidnapped a Dean of Faculty, and as soon as this crazy ship of yours hits Terran authority, you are under arrest. I hope you are satisfied. When you get out of jail," he continued, warming to his theme, "that is, *if* you ever do, you will find that there is no work for you in any institution of learning. You won't be certified to wipe the runny noses of two-year-olds!"

During this speech, Biddle's voice had risen, and he ended with a bellow which should have terrified his subordinates. Ron and Alice, however, were too busy with navigation and communication to pay attention. When silence finally fell, they said nothing. They simply pointed to the comm. screen.

Back on Earth all normal business had ceased, as each Galactic visitor took joyful notice of the event. Finally, two minds among the new member species had been sharp enough to penetrate the wilderness of false clues and dietary guilt which had been sown in the ready soil of Terran obsession with weight. At the solid evidence that Terra had at last passed the test the Galactics celebrated. In Delhi, India, fireballs ran through the less crowded streets, and launched themselves into the air, scattering sparks. Residents who came outdoors at the sudden noise and light were promptly overrun by the ubiquitous /klik, and bounced upon, pummeled, tossed, and otherwise enthusiastically congratulated by a multitude of entities.

In Antarctica City the single Floom, solitary emissary of his/her/its privacy-loving species, rose up from a self-dug snow cavern, quite startling the other inhabitants by rolling genially among them, emitting jovial, ice-shat-

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tering booms.

In addition to the sudden flurry of excited alien activity, users of electrical equipment everywhere were treated to the second Earth-wide Galactic message, which Biddle saw displayed on the *Fat Power*'s comm. screen:

PEOPLE OF EARTH: WELCOME TO FULL MEMBERSHIP IN THE GALACTIC FEDERATION. CONGRATULATIONS. RESEARCH BY DR. RONALD CORCORAN AND DR. ALICE GEERY HAS FINALLY PROVEN THAT TERRANS ARE ABLE TO SELECT TRUTH OVER PREJUDICE.

Most Terrans were perplexed for several days, but by the end of the week the Corcoran-Geery drive became a household word. Once Dr. Biddle recovered from his initial shock at being an unwilling passenger on an impossible journey, he was in a mood to listen. By the end of the trip, he had become a good friend. He was also the first Terran to see truly rapid weight loss in action.

Their destination was a pleasant Earth-like planet circling a modest star roughly in the vicinity of Betelgeuse. *Fat Power* was escorted to the surface by a fleet commanded by the proudest, fattest pilots on the planet. The crowd of natives preened fur and waved tentacles. One, smartly rotund, turned happily to his frankly fat mate.

"Well, Azra, they did it. I knew all along that the fat Terrans were as smart as the rest of us. Too bad they had to put up with so much from Terrans not so well endowed."

Azra nodded serenely in reply. On board *Fat Power*, a considerably slimmed down Ron and Alice donned shiny new Galactic uniforms made to their own end-point specifications, and strode proudly down the ramp, arm and arm with Biddle. As the massed Galactics saw them, there was a roar of appreciation for two sleek, slim Terrans, at the peak of physical condition. Now the party began in earnest, with plenty to eat. After all, Ron and Alice would need it. They had a return trip to make. ■

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Donald F. Robertson

REACH OUT AND TOUCH THE STARS

The key to getting very far from home may be something very close to home. . . .

Where are the companies? Where are the entrepreneurs?

Where is the Solar System East India Company? Where is Heinlein's "Man Who Sold the Moon"? Where is Poul Anderson's Nicholas van Rijn when you need him?

For half a century, this has been the refrain. It has been shouted at science fiction conventions from the tops of glittering hotels. It has been whispered in the small hours, in smaller rooms under dim, yellow light bulbs.[1] Above all, it is *believed* by those select and widely scorned cognoscenti who dream that our human civilizations might expand into the Solar System.

Government space exploration, while not the complete disaster many frustrated would-be space colonists claim, has failed to deliver the goods. There are no planetary bases, no space colonies floating in the void, not even a permanent outpost on Earth's Moon. Nor are there great exploratory expeditions, seeking knowledge and resources along the ancient sea shores of Mars or collecting the commodities known to exist amongst the far asteroids. Nothing, it appears, is happening.

There are three major reasons for this sad state of affairs. Two of them are reasons that nobody wants to hear. First, we have expected way too much, and we have expected it far too soon. Second, beyond telecommunications, there are no readily apparent—and above all, *convincing to the outside investor*—ways to quickly make a buck in space.

Not wanting to hear these truths does not make them any less true. Humanity has had some initial successes at tossing a few people above the atmosphere in tiny capsules and a "winged brick" called the Space Shuttle. We have made landfall for a handful of days on Earth's nearby Moon, and we have survived in low orbit for a year or so in a clap-trap outpost left over from a dying empire. We have made some money bouncing the odd telephone call from one part of our planet to another. These achievements have led some of us to believe that we are on the verge of true Solar System commerce—we are not—and that the task ahead of us is easy—it is not.

Take the first problem first: the space age is just thirty-eight years old,[2]

1. I know, I've done it myself.

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and that is not old enough. The Solar System is more profoundly alien than any frontier humanity has ever tackled. It is also harder to get to: we are imprisoned at the bottom of the largest gravity field amongst the terrestrial (hard-surfaced) planets. Imagine what would have happened if, millennia ago, no humans lived on the continental coasts. What if peoples from the deep inland deserts, who had never experienced a large body of water, had to scale immense mountains to reach the seashore before they could even begin learning to travel over the storm-tossed oceans?

Today, few of us human mammals, designed to live on the African savanna, have ever experienced a large ocean of free fall and vacuum, replete with violent storms of high-energy radiation. We have to figure out a way to get cheaply into orbit, before we can even begin to deal with an environment that confounds our every instinctive expectation.[3]

In the past, new and alien frontiers—such as the African colonization of Eurasia, the Asian colonization of the American continents, or learning to travel confidently over surfaces of our planet's oceans—took many thousands of years. Even the second wave European expansion into America took centuries, in spite of a relatively high level of organization and technology. We've been tackling space for decades, not centuries.

Once we are finally there, the Solar System is a big place. Humanity has barely looked at most of the circum-Solar region (and that by simple robots) let alone understood it. We've explored none of it, save five small sites on Earth's Moon.

Several of the myriad and utterly different worlds of our Solar System have solid surface areas as great as all of the dry-land surface of our home planet put together, many of the rest represent frontiers as vast as any of the terrestrial continents. The same characteristics that make exploring the Solar System an exciting endeavor also make it difficult. There is no reason to expect that learning to live on these worlds, and to confidently travel and trade among them, will take any less time than the human expansion over what is, after all, our own world.

As for the second reason that humanity is still confined to a single planet, how can you make money using something you don't understand? Exploration is a clear prerequisite to productive use, and we can expect little of the latter until we've done a lot of the former. All of that takes time, lots of it.

The third reason things appear to be moving so slowly has to do with perspective. A great many good things are in fact happening in commercial spaceflight, but most people—indifferent to commercial space or too close to the dream to see the tiny, green shoots in the vast, empty desert—are

2. The same age as this author, who was born in 1957, the year of *Sputnik*.

3. The fundamental reason for our frustration is that we are trying to do the latter before the former; we explore the planets with clock-work robots before we have figured out how to get cheaply into space. Then we wonder why it seems so difficult to get there ourselves. We really are trying to run before we can walk.

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simply not aware of them. Most progress, but by no means all, has to do with a familiar friend: telecommunications.

It is time to take a second look at the humble communications satellite. After all, this *is* the one way we know to make lots of money in space. Can communications satellites pay for the rest of what we want to do? Or, at the very least, give us a running start?

Until recently, it would have been easy to dismiss this idea out of hand: as these things go, the comsat industry is tiny; human colonies on the planets big and expensive. Today, those assumptions do not look so certain.

The communications satellite industry is taking off. It is taking off in a big way. In the past decade, the industry has changed dramatically, moving far from its initial wave of a few large geostationary communications satellites used primarily by the world's governments and largest corporations.

The new communications industry in space is building systems of satellites that will cater to the everyday consumer. This is relevant to our goals because of one key fact: the everyday consumer is a huge market. Potentially, the collective consumer market for global telecommunications is as big as five billion people, even in relatively poor countries, everyday consumers control vast amounts of money.

Unlike earlier comsats which were government subsidized in one way or another,[4] the new satellites are all being financed almost entirely with private money. The same is true of their supporting industries like launch vehicles and receiving antennae; and, most importantly, it is true of the new communications services that are the reason for the whole exercise.

After years of work, several companies are on the verge of deploying their networks in low Earth orbit. First to market will be Orbital Sciences Corporation. Already OSC is launching a global network of tiny satellites that will transmit documents from your laptop or palmtop computer to another computer or fax machine at any point on or near the planet. In spite of some initial problems with the first satellites, many outside analysts expect this system to be a commercial success.

Next is likely to be Motorola, deploying a vast network of more ambitious satellites that will relay telephone calls from small hand-held or pocket telephones. This system will do for voice communications what Orbital Sciences is doing for documents. It will allow instant communications between any two points on the globe, whether there is a wired telephone there or not. Both of these companies have a number of smaller competitors, offering less ambitious but cheaper versions of the same services. Yet another variation on this theme will provide fixed telephone service to the Third World and the ex-Soviet Union for far less money than it would take to install land wires to every house in Africa and Asia, or Russia. This most ambitious of schemes is backed by Microsoft's Bill Gates and a major cable television distributor, Bob McCall. It

4. *E.g.*, with government-financed "corporations" like Intelsat/Comsat, Eutelsat, and Inmarsat.

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will require a staggering 840 satellites . . . and *still* be cheaper than land lines!

The least ambitious of these networks requires many low or medium orbit satellites, to make sure that at least two functional ones (that is, two active plus one spare) are always over the horizon. The satellites must be in a lowish orbit so that they can pick up the weak signals from a handheld telephone or palmtop computer. Since a low orbiting satellite suffers from a nearby horizon, it takes a lot of satellites to blanket the Earth. The lower the orbit, the stronger the signal for a given handset power, but the more satellites you need. Adding still more satellites reduces the chances that damaged satellites could interrupt service, which will be crucial to gaining and maintaining market share. Motorola's Iridium project, which is the farthest along of the big systems, requires no less than sixty-six moderate-sized satellites plus on-orbit spares.

At least one of Motorola's competitors, and one or two of Orbital Sciences', is likely to be deployed. Four or five of these networks provide a huge demand for satellites.

This is all very good news. Mostly, it is good news for what it leads to.

More and better satellites require more and better launch vehicles. As I write these words, McDonnell Douglas, a company that only a few years ago was on the brink of bankruptcy, has admitted that they are privately developing a new version of the Delta rocket. Launching satellites is one of the few businesses at McDonnell Douglas that is both growing and believed[5] to be solidly profitable. Today, the Delta rocket is said to earn McDonnell Douglas something on the order of $500 million per year. The company is reported to believe that they can increase that income by at least one-third again by building a heavy lift version of the current Delta-II. This super-Delta would directly compete with Arianespace, Europe's government-financed launch company, and with America's other major commercial rocket, Lockheed-Martin's Atlas (recently bought from General Dynamics).

More and better satellites also require better on-board propulsion and upper stages. McDonnell Douglas had to modify the Delta's satellite delivery stage to win the contract to launch the majority of Motorola's Iridium. They did this at their own expense. Several manufacturers of communications satellites are experimenting with electric or "ion" propulsion for attitude control. These motors can later be applied with very little modification as primary propulsion for the "space tugs" needed for deep space travel.

A few short years ago, rocket manufacturers worried about the addition of low-cost Russian and Chinese launch vehicles to the market. They feared that this would destroy the precarious financial position of the Western launch service companies. Today, the manifests of all three main Western companies—Arianespace, Lockheed-Martin's Atlas, and McDonnell Douglas' Delta—are saturated for years

5. The company refuses to discuss the financial performance of individual divisions with outsiders.

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into the future. Lockheed-Martin's effort with Energiya to market Russia's Proton is selling hand-over-fist. Already, Lockheed-Martin has sold more than allowed under Russia's market-sharing agreement with the United States. This supposedly limits the Proton to nine launches before the end of the century. The Russian-American companies are getting around this limit by calling many of their sales "options." They will become firm sales once the United States recognizes the reality of limited launch capacity and removes the limits. China's Long March series also is selling out. The Ukraine (with Boeing), Japan, and India are also on the verge of entering the commercial launch market.

There is another segment to the commercial launch market, and this one, too, looks very healthy. Orbital Sciences' Pegasus air-dropped small launch vehicle has a solid backlog. This rocket is launching OSC's own satellite network, while also flying the ever smaller science satellites that a broke NASA insists on. A number of other entrepreneurial companies are finding money to develop their own designs. Lockheed-Martin, not to be outdone, is privately building a commercial rocket, based on Lockheed's experience with Submarine Launched Ballistic Missiles. A scaled-up version will compete with the low-end of the Delta family. The primary market for all of this is individual comsats to replace failures in the global networks.

Put it all together, and you have a market for satellites, and the rockets to launch them, that could reach a thousand or more—all paid for with private money. All of a sudden, satellites and launch vehicles are no longer a glorified handcraft, turning out a dozen or so literally hand-made models a year. They are a real industry mass producing commercial products on assembly lines.

These markets simply did not exist five years ago. Crucially, they are global markets. Most of the satellites will be assembled in the United States (or, in one case, Italy), but subsystems are being farmed out all over the world. In addition to the Delta, Motorola has purchased Russian Proton rockets and Chinese Long March vehicles, ensuring that this new industry is not dependent on any one government's policies.

Increasingly, it looks like all of the world's launch vehicle manufacturers, together, may not be able to keep up with demand. This fact may finally be sinking in. To almost everyone's surprise, the aerospace industry, to date more dependent on government largesse than any "welfare mother," may actually cough up some of the cash NASA needs to develop a commercial, second-generation Space Shuttle.

Likewise, a few short years ago, it was predicted that there would be a glut in communications capacity. Now, no matter how many satellites are launched and how much data each satellite can transmit, supply simply cannot catch up to demand.

A key sign of the commercial space industry's health is given by the following statistics: last year, the satellite insurance industry lost three-quarters of a billion dollars as two European

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launch vehicles crashed and one American satellite failed. The insuring companies only took in about one-half billion dollars in premiums. Did the insurance companies raise their rates to cover that loss? They did not. In fact, they increased the amount available to insure any given launch by ten percent. The insurance marketplace is confident that the commercial satellite industry will remain sufficiently profitable for the companies to earn back their loss and still make a profit.

All of that has been achieved with today's ridiculously expensive launch vehicles. What might happen to this market if the cost of access to space were to come down?

Nobody knows.[6] For a hint, let's look more closely at what is happening now. The respected British political magazine, *The Economist,* never a journal to get over-excited by a hot new trend, sees it like this: "Over the past three years the number of satellites in orbit has grown by a half to 2,400, as demand for mobile telephones, satellite television, and data transmission has soared. Whereas Hughes Electronics used to have perhaps ten satellites on order, it now never has fewer than thirty, with a combined value of $2 billion. . . . Critics object that space communications could fall victim to the terrestrial information superhighway. But wiring up America with fibre optic cable could cost a staggering $300 billion, take thirty years, and still be far from global. That alone should provide Lockheed-Martin [and other aerospace companies] with a tidy living from building satellites to relay commercial messages—and rockets to launch them."

Truly flamboyant entrepreneurs, in the Nicholas van Rijn model, have started companies—PanAmSat and Orian—to directly compete with the old government-financed corporations in the lucrative market for international communications. After more than a decade of preparation and political bickering, these two companies are launching global trunk systems—providing yet more markets for the world's commercial launchers.

These giant satellites, high in geostationary orbit, also require big upper stages. Recall Robert Heinlein's maxim that, in energy terms, it is easier to get to Earth's Moon than to geostationary orbit. In space, the energy required to get you going is more important than the distance you have to go. In these terms, it is easier to get to the Martian moons than to either the surface of Earth's Moon or to geostationary orbit. Long after flying to Earth's Moon vanished from America's technological repertoire, humble communication satellites are paying the bills to keep the United States' capacity for deep space transportation in business.

We have looked at the satellites that pay for the rockets that pay for deep-space vehicles that can, in theory, pave our way into the Solar System. At the top of the food chain is a ser-

6. But we might be close to finding out as cut-rate Russian and Chinese launch vehicles increasingly invade the Western marketplace. On the other hand, as Russia and China learn that real capitalist companies eventually have to pay their employees market salaries, the prices of their rockets are rapidly increasing.

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vice. That service, in turn, is fed by the desire of people to talk to and entertain one another.

Surprisingly, one of the most innovative of the space communications companies is also one of the oldest and, in some ways, the most conservative. Some years ago, this company recognized one great truth that almost all of the others had not. The company is Hughes Electronics. The truth is that the information being communicated, and the software used to organize it, are both much bigger markets than the satellites used to transmit that information. Hughes recognized that in spite of being the world's largest builder of commercial satellites, holding well over half the entire global market. Hughes response was simple and, in retrospect, obvious: provide more services to create a bigger market for their satellites.

What communications service does America use most? The answer should be easy: television.

Hughes organized a consortium of American and French companies called Direct-TV. Direct-TV raised almost a billion private dollars to commercially construct three huge satellites and launch them into geostationary orbit. The company built the largest and most modern television production and control system in the world. Still more private money built a production line to produce thousands of small satellite antennae "the size of a pizza pan." And now, you the consumer can get several hundred specialized channels of high resolution television for a cost comparable to your cable subscription. Since Direct-TV's introduction late last year, more subscriptions were sold than the most optimistic forecasts had guessed. Worried cable company executives are said to refer to Hughes' satellites as "Death Stars." Competitors, seeing the writing on the wall, are already building their own satellites. Soon, thousands of television channels will be available.

Industry analysts predict that Direct-TV will result in the "magazinization" of television—sometimes called "*narrow*casting" as opposed to "*broad*casting." Go to a bookshop or newsstand and look at the magazine rack. There are hundreds of titles, often catering to the most specialized of tastes. With thousands of channels delivered nationwide, the few thousand people scattered around the country who may want to watch, say, the exciting sport of competitive model rocket launching, can subscribe to their own channel and still let the supplier make a profit. No longer will a handful of television "networks" have to cater to the lowest common denominator of a big and diverse country.

The same thing is happening with radio. Direct-TV offers thirty CD-quality digital music channels too specialized for local broadcasters, and competitors are planning dedicated radio broadcast satellites. The Federal Communications Commission has allocated fifty megahertz for this service.

Local radio stations are fighting hard in Washington to prevent global satellite radio from happening, but they are unlikely to win. Even if they do, the laws of physics and commerce are against them. According to one executive quoted in the industry journal

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Space News, "The economics of satellite distribution is [such] that we can have one hundred Reggae listeners in Seattle and one hundred in Miami, and we can put them together to build an audience for a Reggae channel." This is something that local broadcasters cannot do.[7]

Much of this new entertainment will be commercial-free, paid for by subscription. Soon, as the small satellite antenna learns to talk back to the satellite, it will become interactive.

Hughes has other ideas up their collective sleeve to keep satellite production lines busy. In spite of the wide availability of video rental stores, some people still like to go out to the movies.[8] One of the greatest expenses the film industry incurs is copying and delivering heavy canisters of film to the nation's theaters. This physical transport of information also makes theft and piracy of the film itself all too easy, especially overseas. Hughes proposes replacing the film screen with a super-high definition television and directly transmitting the film via satellite to each theater. This would allow higher resolution and brighter colors, much lower costs, and, since the information would be coded, fewer opportunities for theft. Still another plan is to deliver software via satellite, avoiding the expense of physically copying and delivering diskettes.

Hughes biggest idea, called Spaceway, is that old chestnut the video telephone. The new plan is a little different from the old one promulgated by the likes of AT&T. There is no telephone, with its slow and grainy picture, physically attached to a wire. Spaceway would use your television or high resolution computer screen and a small antenna like that used for DirectTV.

Originally proposed as a national system, and later expanded to be global, Spaceway will involve a system of extremely high data-rate satellites in geostationary orbit. Hughes is already building the satellites. At first, the main application will be corporate videoconferences, but Hughes sees the system slowly expanding to individual households. Eventually, it might replace the entire wired telephone industry.[9]

Space is becoming a place where the fastest-growing industry on Earth, and one of the largest, does much of its business. This change has hardly been noticed by space advocates, dreaming in their dark basement rooms, yet its significance cannot be over-estimated. For the first time, private money is financing huge and diverse commercial space programs. Soon, the cumulative economic impact of these projects will dwarf Apollo.

Orbital Sciences, for instance, offers a range of small launch vehicles, deep space propulsion, science and applications satellites, and Communications

7. In reality, local radio broadcasters are likely to survive, just as cable television did not destroy local broadcast television. Global radio is unlikely to supply much local news, nor many traffic reports.

8. Your correspondent is one of them; he does not own a television. He frequently has no idea what his friends are talking about.

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services—all under a single roof, almost all privately financed, and all at less cost than any space program in the past. Giant Lockheed-Martin, looking for a way to make money after the Cold War, is following Orbital Sciences down the same road.[10]

Of most importance to us some of these endeavors, if they make money, may slowly grow into the great space-faring corporations of the future.

There is a cloud on the horizon. This whole bright future is at risk. The problem is an initiative by one Vice President Albert Gore. Al Gore is probably the most influential vice president in American history. He has converted what is traditionally a ceremonial post into the Clinton Administration's "think-tank." With the best of intentions,[11] Gore proposed what he calls the "Information Superhighway." It is a measure of Gore's influence, both inside and outside the Administration, that his term has become universal. It is used to describe everything from a fiber-optic telephone network to something closer to Gore's vision, a sort of super-Internet.

Gore originally envisioned a government-subsidized network of fiber optic trunk lines to tie Federal laboratory and University super-computers together. This system would eventually grow to incorporate companies and individuals. The primary model was the growth of the Internet itself, which started as a project to link military research establishments. Today's primarily civilian "global library and coffee shop" would hardly have been recognized at the time by the Internet's founders, most of whom are still alive.

The other model was the freeway system, which may have been built by private contractors, but also started out as a military project. Even today, freeways are planned by government agencies and paid for with a combination of user fees and heavy subsidies by the Federal government—all to achieve a goal that no private consortium could manage.[12] Hence the name "information superhighway." The goal is to achieve for information what the highway system did for physical communications: to tie the nation and the

9. Note in proof: Hughes has just sold a complete satellite-based wireless telephone system, involving two geostationary satellites, to an Indian company called Afro-Asian satellite Communications, Ltd. ASC is based in Bombay and is investing $700 million on the project. India, in turn, hopes to market the service to users in Southern, Central, and East Asia, and in Africa. The company will provide basic telephone service to villages without having to lay physical wires throughout this vast region.

10. Increasingly beyond government control, these new communications industries will become a strong bulwark for global democracy. As predicted decades ago by the inventor of the idea for geostationary comsats, Arthur C. Clarke, a strong case can be made that it was the wide availability of satellite communications, and the consequent impossibility of controlling information, that brought down the Soviet Empire. Much of the same may be happening in the world's last great military empire, China. China has utterly failed in her attempt to outlaw private satellite antennae. The United States learned this first in Viet Nam. Information limits the ability of a government to act without the consent of its people. Indeed, the United States was founded on this principle. And comsats make information available to anyone who can afford and hide an antenna "the size of a pizza pan."

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world together, both politically and economically.

Gore's vision has evolved. Confronted with the reality of America's vast and balkanized telecommunications infrastructure, the new vision is a bit less clear. Today, Gore seems to want government encouragement, possibly with a more limited financial contribution, for the telephone companies to expand their capacity, in competition amongst themselves. But the government-set goal of directly wiring every public organization and private household to a national high-capacity network remains.

Either way, the whole idea is anathema to the satellite industry. They see Gore's vision as a government subsidy for the telephone companies to undercut what the satellite companies are doing anyway, for vastly less money. It also undercuts one of the last industries where the United States is unquestioned world leader. Worse (at least for space advocates), the information superhighway undercuts the one commercial space industry that is, and would otherwise continue to be, an unqualified success.

Hughes argues that their Spaceway project will cost a minute fraction of what it will cost the telephone industry to wire every household with fiber-optic lines. It is simply cheaper to supply each business and household with a satellite antenna, than it is to dig up the sidewalk in front of every home. To fight Gore's telephone subsidy—or at least get equal time at the government trough—Hughes has organized a number of other satellite companies into a pressure group called The Satellite SuperSkyway Coalition.

The Satellite SuperSkyway makes a lot of sense for the individual, private user. You get more autonomy: you own and control your own antenna, your end of the network, a receiver that can listen to anybody's satellite and is almost impossible to ban or jam. Therefore, it makes for better democracy: relatively poor people far from civilization can afford a cheap satellite antenna; you can bet that the rural farmhouse will not be first on a telephone company's list of organizations to physically wire up to the network.

If the government were simply to keep its nose out of the tent, argues Hughes, the cheaper system would win. The Information Superhighway would become a reality in the sky sooner and at no cost to the taxpayer.

In the process, it would result in the greatest new investment of money and labor in space since the Apollo program. Since there is a real, commercial reason for that investment, it is likely to be more permanent than the politically-motivated Apollo flights to

11. Your correspondent frequently supports Clinton Administration policies, particularly the first honest attempt in two decades to responsibly manage this nation's finances. Nothing that I say here should be interpreted to mean that I subscribe to the "Clinton-bashing" promulgated by certain far Right radio talk show hosts, a movement that demeans rational political debate and that I deplore.

12. There is nothing more "socialist" than America's freeway system, humanity's largest engineering creation to date. While the highway and freeway subsidies dwarf Amtrak's, somehow they never make it into the public debate over the budget deficit.

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Earth's Moon could ever be.

It might seem that I have painted the future in two entirely different lights. The future portrayed in the first part of this article would be the pessimistic version; the latter parts the optimistic one. In reality, both versions are equally true—and equally important.

Commercial space is growing explosively the world over. It is right to feel optimistic. However, in terms of what is needed to establish colonies and start trading throughout the inner Solar System, this growth is starting from a very small base.

To avoid the disappointment and "burnout" that inevitably result from over-optimism, it is important always to keep our achievements in perspective. This is what advocates for settlement of the Solar System have consistently failed to do. A couple of years ago, United States generated more than six billion dollars in economic activity every year from commercial activities in space; today's figure is certainly higher. Six billion dollars is a lot of money, but it is a long way from conquering the Solar System. To coin a phrase, we should be "cautiously optimistic."

But optimistic we should be. Already, it is possible to see the outline of a believable scenario for getting from here to there.

To build the road to a Lunar settlement, or a base on an asteroid or a Martian moon, you need just two things: a way to lift lots of material to low Earth orbit; and the ability to move that material to lunar (or Martian) orbit and eventually to the surface. Both of these capabilities have existed in the United States for almost three decades. Contrary to popular opinion, they are still available, just not being used for the desired application.

As we discussed before, these capabilities are paid for by the communications satellite industry, which needs a steady and growing supply of the means to get to low- and geostationary orbit, at ever lower cost. These capabilities can be bought from private companies in a handful of countries, and increasing competition is driving reliability up while forcing costs down. Also, recall that in energy terms geosynchronous orbit is slightly harder to get to than the surface of Earth's Moon and that the Martian moons are easier to get to than either location. Easiest of all are the near-Earth asteroids.

These are lucky coincidences. They mean that the cost of getting to Earth's Moon or to Mars is steadily falling without actually having to go to either location. Getting better at space transportation is independent of the purpose for that transportation.

Someday, if transportation costs get low enough, a base on a near-Earth asteroid may start to deliver oxygen and hydrogen fuel to move satellites around. Some of the oxygen would be delivered to the Space Station for astronauts to breathe, and, combined with hydrogen, to make water to drink. When and if that happens, trade will have begun, and the railroad into the Solar System will truly be open.

Other key technologies are coming together. Experience with military submarines and a steady trickle of

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flight opportunities on Spacelab and Spacehab, on the Russian *Mir* space station, and eventually on the international Space Station, are driving steady progress on life support. This progress may appear painfully slow to Americans used to everything being resolved in a one-hour television show, but it is progress nonetheless.

On the surface, Space Shuttle flights may look like a waste of money; but despite its poor reputation, the Shuttle's problems are solely and reliably getting into orbit. Once she manages to get there, the Shuttle orbiter is orders of magnitude more capable and flexible than any other space vehicle ever flown. Flight by flight, the Shuttle is creating an ever-growing base of experience in living and working in space. A tiny example: approaching the Russian space station without damaging it required inventing a new way of approaching a target spacecraft. This new technique uses much less fuel than the old method which dates from the Gemini program.[13] Docking spacecraft now costs less than it did. You must fly to learn, and the Shuttle is flying.

Nonetheless, the fact that NASA cannot afford a replacement for the aging Shuttle is probably good news. NASA will pay for research to help industry pay for developing a vehicle, one optimized for commercial purposes. NASA's director, Daniel Goldin, is trying to get the law changed so that the space agency can guarantee a certain number of flights (say, to the Space Station) to any aerospace company that develops a new, low-cost reusable launcher. Short of other business options, several companies are taking this idea seriously. The exploding market for comsat launches, combined with renewed competition from low-wage industries in China and Russia, must be in the back of their minds.

For a decade, commercial investment in space has been experiencing a slow but relentless growth. This growth is on an upward curve and there is no sign that it will level out anytime soon.

Someday, not next year but within a few tens of years, the humble telephone, and its cousins hooked into the Internet and to your television screen, could slowly build a revolution. They might yet generate the kind of money that could casually pay for commercial infrastructure, and even settlements, on the planets and in the asteroids.

Promise it to your children, but don't hold your breath. ■

13. Russian cosmonauts watching from *Mir* expressed admiration at the precision with which the Shuttle approached.

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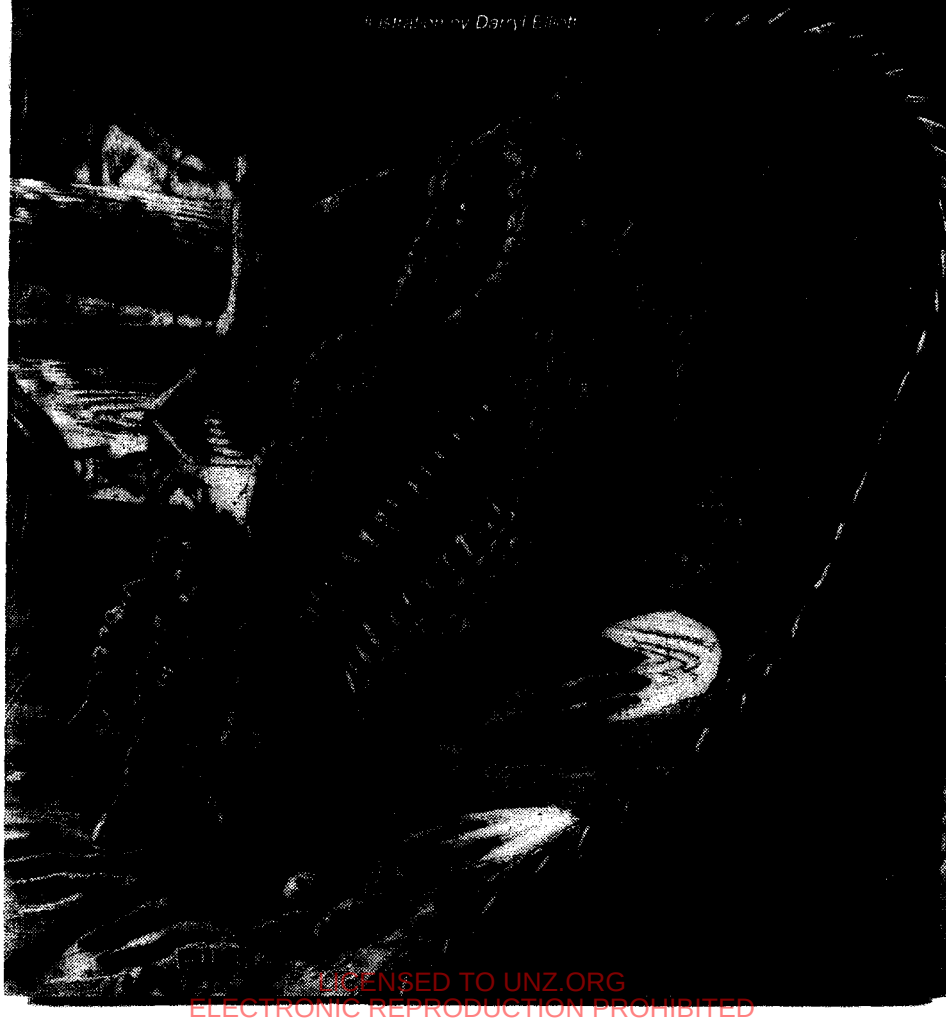
William Rotsler

WHICH CAME FIRST?

The right answer could obviously make a very difficult job much easier. Obviously . . .



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It's hard to run for your life carrying an egg as big as a watermelon. An egg is awkward to carry when it's over a foot long, delicate, you're out of breath, and your side hurts. And it's umpteen-ton mother is thundering along after you. You tend to look over your shoulder a lot and trip on roots and vines and maybe scream now and again.

It was not the only dinosaur egg in the world—not that world, anyway—but if I could get a few hundred yards farther and nothing happened to the time machine, it would be. Sixty-five to eighty million years from now. The dinosaur egg, that is.

They wanted a dinosaur and they knew they weren't going to get any dinosaur anyone would pay to see into the TDC—Temporal Displacement Container, as they flat out refused to called it a "time machine." So some bright physics weenie figured out the egg came first, and it was a lot more portable. Two or three eggs would be even better.

A lot they knew.

All they needed was someone dumb enough to say, "I'll go," and I was the one that said it, for reasons of my own. "Uh, OK, I'll do it." But I'm no dummy, I'd read SF. And real science, too.

I understood what was needed. "I go back, get an egg or three." I had looked around the conference room and continued. "OK, that means that particular dinosaur never existed, never had his or her own family of little dinos, which in turn never had kids, etcetera, etcetera."

Several people nodded wisely. "So I swipe some eggs and whammo, there's no civilization-as-we-know-it, everything looks like Cleveland, the Chicago Cubs win the Series, and Rush Limbaugh is king."

No, no, no, they said. They talked—with their hands, too—a long time, often at the same time, selling me the idea. It boiled down to this: Time was not linear, not exactly, or more exactly, it was a whole *lot* of lines, rather like a tapestry. You cut one thread, the design doesn't change, certainly not significantly. They talked well.

They'd gone to a lot of school, and had capital letters after their names.

Get the egg, they say, and some other thundering lizard will fill in as guest ancestor, and we here in the Oohs would have the most incredible draw ever. The year 2009 would be the year Johnny Ryan brought back the first dinosaur. Live. And in whatever color they came in.

Think of the merchandising alone, Johnny, Parkinson said. Five hundred million, at least, and you'll get a piece. Movies, TV, your life story, you'll be on every talk show in Christendom, on every best-seller list—we'll make *billions.*

Bring back eggs of different *types,* Stillman said, it'll help merchandising. Oh, and science will *love* you.

More things to sell, Wilson said, and Gold nodded in agreement. We'll have eggs and little dinos, grown-up dinos, ferns, a model of the TDC. We'll have clothes for you to wear that can go on action figures, Miller added. They'll have lots of pockets—so pick up anything interesting, he said.

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We're developing a helmet cam, Simpson said, adding that it would run from the time I left until I got back, so watch my language. Plus before and after interviews with scientists to postulate and evaluate.

So I said I'd do it. They seemed relieved, so I guess volunteers weren't so easy to find, after all. But I didn't do it for the reasons they thought. They thought I wanted the money and the starlets and the groupies and the Fame. (When they said it, Fame was always capitalized.) I did it because I had to get out of town for awhile. And quickly. There was this misunderstanding with the Jaroslava brothers and they'd given me a deadline I hadn't a chance in hell of meeting, or postponing.

It wasn't until the countdown started that I realized something terrible, and then it was too late. "See you in a few minutes," the weenie in the white lab coat said.

"A few minutes?" I croaked. Inside, I was going *Whaaat?*

"Oh, it won't seem that way to you," he grinned back. "You could be there a week, an hour, a year, you'd still come back in . . ." he looked at a dial. "Ten minutes. Just long enough for the gaffers on the frandistats to cool down and the gamel-brinners to get back up to speed."

OK, so that's not exactly what he said, but that's what I heard. "But, I—"

Then things shimmered and lurched and suddenly everything stank and I was in some kind of weird fantasy forest. I knew at once I was in even bigger trouble that I had run away from.

For one thing there were bugs. Big bugs. All over. It was hot and humid beyond belief. I hate *heat* and humidity. I hate bugs, I *hate* anything with more than four legs and less than two.

As the air I'd brought with me dissipated I felt there wasn't enough air in the air. Even so, I might have said OK, I can live with it, if *it* hadn't whirled around and looked right at me.

It was a reptile, as big as a mean pony, but with two legs and a long neck with a small head, big eyes, and a tail that whipped up and straightened out as it ran at me. It looked vicious, hungry, and an efficient killer. It also looked—I swear—eager.

Squish, skoosh, splot, it came charging, slashing through these fern things, around some kind of spiny tree, and it took that long for me to unfreeze and react.

Keeping the "tapestry view of time" in mind, I had brought along a Colt Python .357 with hollow point ammunition. Before I was eaten, one or more things were going to eat lead. I didn't care if a Volkswagen in Idaho or a Formula III on the bricks coughed and stopped, because there was no gas in the tank, because I'd clobbered a family line of lizards. I squirmed out of the TDC and hauled out my pistol.

I hadn't counted on my hand shaking. I forgive myself—after all, it was the first time a *Homo sapien* had ever faced a dinosaur who fancied him for lunch. No matter how many caveman movies you've seen.

So I shot. It was very noisy. Besides all the squish, splat and glop, there

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was *Awk* and a kind of *Spaa—!* that really disconcerted me more than somewhat. The jungle I was in came alive.

Again, unlike the movies, big guns make Big Noise. KA-BOOM! it went—just like they say in the comics. The first noise of its kind in the history of the worlds, strictly speaking.

But I missed. Startled, this scaled "it" started running in the other direction while it was still on its kill-run at me and ended up tangled in its own feet, falling heavily on its side, splashing me with sticky, oozy, stinking mud that had *things* crawling in it.

It whapped its tail against the tree I had jumped behind. The tree shook, showering down a lot more creepy-crawlies. Everything around me started running, hopping, inching, galloping and humfullnating *away.* Things came up out of the mud and slithered off. Birdoids with very long tails flap-flap-flopped away. Some made noises, some saved their breath.

The big scaly thing that had prompted this display of sincere but erratic marksmanship, kicked and scrambled to his, her, or its feet, scattering mud and greenery, and went off *that* way, zero to sixty in ten seconds. I was left alone, comparatively speaking.

Well, not quite alone. Things crawled on me. I itched, I dripped, I stank, I shivered, and I thank God that Wilson had insisted on all those shots and Gold had agreed. I slapped off what I could and started walking. I was supposed to be searching but I was really just walking.

I knew what I was looking for, of course, I just didn't know what it looked like. No one did. Dinosaur nests hadn't made it into the 20th century.

Maybe a mud structure, like a swallow's nest, as one consultant had insisted. No, like a bird nest, Wilson said, only bigger, and Gold had agreed. Not in a tree, probably not in a cave—they're too big—Simpson explained. Maybe in the sand, like a turtle, Stillman suggested, adding that I should keep my eyes open.

Whatever. They didn't know, I didn't know, so go look. I went looking.

The paintings they had shown me of this period had all looked so clean, Busy, but clean. They left out the stink, the thousand-bug-per-square-yard count, the unseen bacteria, the wet, the heat, the watery sounds, the heavy air. Flies—or whatever they were—thought I was delicious. More stuff slithered around underfoot. Something howled, something grunted, something screamed. The trees looked the way a kid draws a forest. Not real, but big, simple.

I remembered something from all the damned lectures they set up for me. It was a *Deinonychus,* better known to dino-lovers everywhere as "terrible claw." That meant I was in the Early Cretaceous. At least that's where they *said* they were sending me, about sixty-five to eighty million years from breakfast this morning. The Triassic and Jurassic were history, and here I was.

It was a major effort to unclench my hand from the customized grip of the Python and holster it. The only reason they let me take it was because

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if something dined à la carte on imported *moi* they'd have to start over. Also they didn't want to scare me into thinking I'd really need it.

So they kind of pretended not to see the holstered revolver and the filled cartridge belt. It was, after all, near the end of the Age of Dinosaurs—what real harm could I do? These guys had a date with a meteor, anyway.

So I trudged on, not turning my head too quick so that the helmet cam could get shots that didn't make viewers seasick. The ground slanted up a bit and got less gooshy underfoot. The jungle thinned out and I got some Sun now and again. I was in central Montana, or what would be Montana. I saw a pterosaur flapping along, as big as a World War II fighter, and looking very much like a special effect.

Then I saw the nest.

I knew what it was right off. A kind of depression out in the warming Sun with three-foot prints all around it. The three big spotted eggs were a tipoff.

Now all this running around jillions of years before I was born was all very nice, and I'm sure there were some who would be taking notes like mad and peeing in their pants over the wonder of it all. I was on the verge of soiling myself all right, but mainly because the hard part was now here—stealing the children of something that made three-foot *dents* in the hard ground when it walked.

I hunkered down behind a spiny bush and fished out the field glasses and took a look around. I saw a lake and something that reminded me of the discredited Loch Ness monster in the shallows. It was placidly eating slimy plant stuff. Fine. It was the carnivores I had to watch for. Like the one who had laid those eggs.

I got out my net bag and started creeping up on the nest, out in the open—until I realized what I was doing and just straightened up, glanced around and stomped over and took all three eggs. They were big, heavy, speckled, warm, and dirty. I figured the shell had to be thicker and stronger than the chickens of my time, but I still put bubble packing around them.

I felt momma before I heard her.

I heard her all too well before I saw her, but by then I was running. I caught a glimpse as she came up out of the forest on one side and I fled in the other direction, adrenaline-powered.

The mother. Momma *Tyrannosaurus rex*. The biggest and most powerful of all the carnosaurs. This one was a good eighteen feet high, about forty feet long, and the Sun glinted off wet teeth as long as daggers.

I knew she wasn't really smart, but since she ate mobile living things she had to be smarter and faster than animals that ate grass. As the man said, it doesn't take many smarts to sneak up on a blade of grass. And this was all her turf.

OK, I was scared. I ran. If you thought you wouldn't, you're a liar. I slipped and fell, but I always held up the bulging net. Something small and snarly popped up in front of me, hiss-

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ing horribly. I jumped over it, and kept going, breathing hard.

I activated the homer and it beeped me to the northeast a bit. Then I heard the roar. Then another roar. Momma had discovered the foul deed. She'd gone off for a *moment* and her eggs were gone.

I don't know if things as big as loading cranes have a keen sense of smell or not, or whether she saw me, or *what,* I just knew she was on my trail. I could heard things behind me being stomped, squished, sploshed and splattered. Things cawed and squawked and hissed and flapped and scurried and burrowed.

My heart was beating so fast it hurt. My lungs hurt. Some kind of flying bug fluttered up in front of me and I took it right in my mouth and that was when I realized I was screaming. Well, maybe not screaming, but certainly breathing out hard, real hard. OK, I was screaming.

I spit out whatever I'd gulped, tumbled down in the muck, staggered up like a three-day drunk, spit some more, untangled my foot from what I thought was a root until I saw the scales—and ran some more.

I slipped and crashed into a thick, pineapply-looking tree and suddenly there was eggstuff all over the front of me. I held up the net bag, even as my feet propelled me onward, and saw that two of the eggs looked OK. But the smashed egg contained a pretty well formed—and decidedly ugly—*Tyrannosaurus* chick.

I plucked at a few of the larger shell fragments, saying, "I'm sorry, I'm sorry." But I knew, fully-grown that ugly little chick could have swallowed me whole, literally, and still be looking for dinner.

The beeper was beeping and out of the corner of my eye I saw something pacing me, slipping through the trees. *Oh, my god!* It was the fleet-footed *Deinonychus* again, or one just like it.

I was running, it was running and behind me *Mother* was very definitely after me, a flat-footed, ground-shaking, distance-chomping run. No sluggish dinosaurs here. Obviously not cold-blooded.

I began to wonder if they had told me everything I needed to know about the time machine. The Temporal Displacement Container, that is. Maybe it needed warming up. They had said they had "foolproofed" it—there was a red button labeled BACK. But maybe they had to burp first, or get it up to speed, or something they thought everyone knew but I didn't. Maybe I should have paid more attention.

They had all treated me as if I wasn't smart enough to understand anything, which I frankly resented, but I needed a fast ticket out of town. I knew I wasn't going to have much of a "window in time" as professorial types talk.

My past and future difficulties with the Jaroslava brothers were unimportant compared to whether those lab-coated wimps had thought about the necessity of fast takeoffs. For all I knew, fast to them was a swift ten minutes of preflight.

The deino was angling his run. It was aiming to have eggs with his ham. I pulled out the Colt Python and was about to let one go in the scaly

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fella's direction when my outstretched arm ran into a sapling and the gun spun off into the gooey mud. I yelped and groaned because it felt like my forearm was broken. That left just running, the most ancient of defenses.

The damned deino made an agile side jump over a fallen tree and damned near landed on me. This was not its first run-to-ground. I swung to the right and leaped over a thorny bush. Something snapped at my feet.

The deino braked, twisted and came at me again. A lot of teeth and bad breath, very close. Too close. I swear its eyes were red. I put up my left hand to ward off its striking head before I realized that was the hand with the bag of eggs.

Scrunch! Deino's snout broke another egg, splattering us both. I moaned, spit out stuff, and ran. I couldn't veer very far one way or the other or I'd never get to the TDC.

I could hear the thunderous footsteps of Momma Rex, then a horrible squeal, a throat-ripping cry of distress that stopped, suddenly. I shot back a look. The momma beast was throwing aside the pony-sized deino without slowing. I didn't slow either.

I thought of Ray Jaroslava, who liked to hurt people, and of Millie's Turn of the Century Burgers and ice cold beer and Len and Paul and Gloria and that sitcom set in the Moulin Rouge with all those well-built women and the one that looked like Suzanne and—

WHUCK!

I ran into another tree, but this time my left arm shot around it. The last egg was saved, swinging in the net bag with the gooey bits of its littermates. The beeper was leading me and I was leading an outraged mother monster who weighed more than an African elephant, only with claws and teeth.

Just a little farther.

I was pumping in the incredible smells and my side was hurting me like one of Ray Jaroslava's "reminder" hits. Maybe I was hallucinating but I had this incredible thought: Momma Rex gets me and I'm dead, rotting, and all this 21st century bacteria inside me is what killed off the dinosaurs. I kill off the big lizards.

I was hallucinating. It flashed through my tumbled mind to stop, hold up the Python to the egg and snarl at Momma Monster, "Lemme alone or the kid gets it!" But the gun was back there somewhere, maybe to be found and wondered about down the pike by Ogg the Wonder Neanderthal.

Oh, god, I was *hallucinating.* Oxygen deprivation. Fear of imminent death. Did it matter?

Then there it was, just ahead, the time machine. No Wellsian dream of Victoriana, no gleaming capsule of super-steel with drifting steam and electronic music, no beep-beeping lights, just a rather fragile open gridwork I'd come in. I saw a red light blinking and for a second I couldn't remember what that meant. Good? Bad? Usual?

Something yipped and fanged me in my boot. I kicked at it, yanked open the door and dived in, careful to keep the last egg from hitting anything. I stuffed it into the space pro-

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vided even as I slapped the red button marked BACK. Then I just hunkered there, watching Mom knock down a tree and coming raging right at me.

Don't blame you, I thought. *I'd do the same.*

The ground shook from her bellowing and I started to scream and—

—Stopped. They were staring at me. Physics weenies in white coats with pocket protectors, guys I knew. Sterile lab. They were outside the chamber, staring in. I was inside. I was back. In the isolation room. I was alive.

When they let me out the bug boys—as I called them—went silly over the stuff they found on and in my clothes. They went totally crazy over something they found in my shorts. That was in my shorts?

They rushed the remaining egg off to the incubator. In fact, they had several incubators. I'd disappointed them there.

But the thing that they loved was the dead but almost intact little bugger that had bitten into my boot. It was a whole different field or something and a separate team was put together for it.

They orchestrated the publicity thing quite well. The whole time travel thing was declared illegal or something and handed over to the military. I was a hero. My clothes ended up in the Smithsonian, along with the helmet-cam footage. Including the screaming.

I got pretty good at telling the story on the talk shows. A ghost writer began my autobiography. A pretty good actor with a history of adventure films—whose only resemblance to me was that we both had two eyes—was signed for a picture, but by the time it came out it didn't do that well, because everyone had seen the helmet-cam footage a million times.

The dinosaur was born and is doing well. He eats a lot but they don't show that much because he prefers carrion. I didn't know what carrion was either, but it's old dead meat. Smelly old. Ripe. They call him Rex, what else?

Tonight I have a date with a female cousin of the Jaroslava brothers. They've been handling my investments. They suggested it. But it's been OK. No, really.

Things look the same. But then, if they didn't, I'd be the only one to know. Rush Limbaugh isn't king and only Cleveland looks like Cleveland, thank God. At first there was talk about me going back—I guess they wanted a sequel and figured they could talk the military into it—then suddenly no one was talking about it.

I had no intention to go back, at least not without the Marines or a SWAT team, but I got curious. How come the sudden blackout? Wilson finally told me, and Gold agreed.

Time travel to any period over 10,000 years ago was forbidden, *verboten,* a sincere forget-it. "Six million years ago," Wilson said, "our genomes were a bit less than 2 percent different than a chimp. Today we're only 1.6 percent different."

"So?"

"Well, uh, that thing that bit you, it

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was, um, 18 percent different but it was seventy-one million years back."

"So?"

"What it means is that thing that chewed your boot was an ancestor. Sort of."

"Sort of?"

"Close enough. We've stopped time travel to anything even close to that time."

"So?" I hadn't planned to go anyway.

"You might step on an ancestor, a crucial one. Maybe humans wouldn't evolve, or not evolve the way they did," He paused. "Uh, time isn't as much of a 'tapestry' as we thought," Wilson said, and Gold agreed.

"So I'm the only time traveler?"

"Well, yes," Wilson said and Gold nodded. "But after they get the safeguards planned out they *might* go back incognito."

"Scares 'em, huh?" I said.

"It should scare you, too," Gold said, and Wilson agreed.

And it did. ■

IN TIMES TO COME

January 1996 marks the 66th anniversary of *Astounding/Analog,* and we'll celebrate with a double issue packed with special features. First and foremost, of course, is a large and diverse selection of fiction, leading off with Alexis Glynn Latner's cover story "A Pillar of Stars by Night." The title refers to the technological centerpiece, a novel and imposing structure for getting out of Earth's gravity well. But the story isn't just a showcase for that, though it does make quite a cover. It's also a thoughtful look at some of the *non*-technological obstacles between here and there. Readers of this magazine have thought a lot about why we should go to the stars and how we might get there. If we really want to, though, maybe we'd better give a little more thought to why some might prefer that we didn't. . . .

The nonfiction line-up includes all the usual plus a few extras. A "State of the Art" piece, for example, with some constructive suggestions about how science fiction readers can promote the health of the field—and use it to further other ends as well. There's a "personal experience" piece from a reader who found a way to experience weightlessness in space—and tells you how you can, too. And instead of a single fact article, we have a "debate" between Stephen L. Gillett and Thomas A. Easton on that overriding issue of population and the future. Not wanting to lay out a monolithic thesis that you might dismiss as "the *Analog* party line," we've paired thoughtful essays from both optimistic and pessimistic viewpoints, with a wrap-up in which the authors meet to discuss where they agree and disagree.

All in all, you'll find our 66th anniversary issue an enjoyable and thought-provoking feast of ideas and stories.

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BEST OF BREED

For a quarter of a century, my wife and I have bred and raised Golden Retrievers. We got into this because my brother-in-law ran Guiding Eyes for the Blind. At that time, this organization used Golden Retrievers because the members of that breed were intelligent, easy to train, very laid back, and highly empathetic. He gave us a Goldie pup for Christmas, and that was our undoing. We've had one Goldie and often three of them at once ever since.

We bred our bitch because she was such a great animal and we wanted a pup from her.

Canine generations can be as short as two years and even the hardiest of breeds often do not live more than 15 years. This was a grand experiment because, in 25 years, it's possible to breed 12 litters. We didn't pursue it that aggressively, however. Goldies usually have litters ranging from 8 to 12 pups. Handling even 6 puppies is a circus. Both the bitch and the family need respite.

However, we have bred nine litters totaling about 50 puppies.

Both my wife and I know about genetics and eugenics, so we were careful not to make many of the mistakes of other breeders we got to know over the years. We never engaged in line breeding, which means mating a parent and one of the parent's pups, for example. We were careful to make sure that no common ancestors existed for at least three previous generations. We out-crossed a lot, bringing new blood into the line every time we could. Inbreeding usually maintains unwanted recessives, and we've seen the results of that: dogs with dysplastic hips, eyes prone to cataracts, and other maladies.

In spite of our careful work, we learned that genetics isn't yet a real science because we couldn't perform pre-mating gene analysis and thus eliminate unwanted traits. Our last litter had a high percentage of pups that were far larger than the breed standard and prone to epilepsy. In brief, we didn't yet have the genetic technology assumed in *Beyond This Horizon,* a truly predictive SF novel by that master of forecasting, Robert A. Heinlein.

However, we were highly successful in breeding for personality. And for perpetuating the basic traits for which Golden Retrievers were originally bred during the nineteenth century in Scotland by Lord Tweedmouth: the ability to recover game birds from the

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water with a soft mouth that didn't damage the fallen quarry. Our Goldies loved to swim and did so naturally. They loved to retrieve, and a game of "fetch" came easily to all of them. Furthermore, they had the gentle temperament that made them outstanding family pets. We kept a male out of the last litter we bred. He turned out to be so laid back and lovable that I often tell people he has only enough brains to run the dog. Still, he's smarter than a lot of other dogs and many people whom we know. However, we could never get him through obedience training. He just isn't that intelligent.

Dogs have been human companions for unknown millennia. We don't know when the first dog licked a human hand instead of biting it. We know that the Egyptians used dogs in hunting. The American Kennel Club now lists 115 different canine breeds. Most of these breeds were deliberately developed with specialized tasks in mind. Terriers are diggers for small varmints. Salukis and greyhounds are runners who will chase down and weary fast game on the steppes. Huskies can withstand the arctic cold and are strong and hardy enough to pull sleds and sledges for hours. Collies, Shelties, and other herding dogs are experts in handling sheep and even cattle. Every single one of the AKC breeds was originally developed to perform a useful task and thus to help humans. They were also bred for their intelligence. If they weren't smart enough to be housebroken or learn how to flush game, for example, they were probably neutered or, if not, then eaten. In many parts of the world today, dogs are not only companions; they are part of the menu.

Anyone who believes that a dog isn't intelligent has never watched a sheep dog work. Or seen a guide dog navigate a path through heavy pedestrian and auto traffic with a sightless person holding the harness. This is more than sheer training. The dog must make decisions, often based on unique new circumstances.

On the other hand, sheep were bred for the quantity and quality of their wool. Over the centuries, the sheep that were allowed and encouraged to breed were those with the sort of pelts that the sheepherder or the marketplace wanted. A smart sheep wasn't needed or wanted. Hence, smart sheep weren't encouraged to breed but were probably eaten first. Some types of sheep were bred strictly for their meat, and often for specific parts such as the tail.

The same holds true of pigs, goats, oxen, and cattle. In fact, the domestication of these animals is an integral part of the Neolithic revolution that produced agricultural technology—the selection, breeding, and growing of wild plants that became domesticated wheat, millet, and other food grains. Without the tamed barnyard animals that could store the energy of grains and grasses and then be eaten during the lean months of the year between harvests, agriculture would not have developed. In fact, in the herding cultures of central Asia, it did not. Furthermore, goats and sheep could graze and thrive on land that would not support crops. All of the domesti-

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cated barnyard animals also produced by-products. The first to use every part of the pig except the squeal wasn't the Chicago meat packer, but one of our remote ancestors.

In parts of the world where domesticated animals were *not* a part of the barnyard, things didn't progress as fast or as fully as where they were.

Horses were tamed somewhere in trans-Caucasian Asia. Originally, they were too small to ride. Horses were used to pull sleds, wagons, and war chariots. Oxen were also used as draft animals. Horses were second-best to oxen even after the horse collar was invented because oxen were more rugged. But horses turned out to be faster and, in the proper harness, better load haulers because they were smarter, could be trained easier, and could also be ridden if necessary.

Over the centuries, horses were selectively bred until they were large enough to ride. Then they were further specialized by breeding until today we have the massive Clydesdales for pulling beer wagons. The Thoroughbred has been specialized for running fast. The cow pony has to be smart enough to help a cowboy do his job. The American Quarterhorse, originally a quarter-mile sprinter, is now for general use in the rugged American West. The proud Arabian has become a recreational saddle-horse and financial investment. And the various German warm bloods, originally developed to carry the weight of a knight in full armor, are used today in dressage, that leftover remnant of teaching noblemen how to handle their mounts in battle.

If a horse turns out to be intractable, impossible to train, or too stupid to anticipate the movements of a cow or the desires of its rider, the result is cat food (except in France where horse meat is still sold for human consumption).

Briefly, then, over the centuries human beings have grossly perverted the wild stock of dogs, horses, sheep, pigs, cattle, oxen, and goats. In some cases, the departures from the original breed lines have become so divergent that cross-breeding isn't possible. However, a wolf and a coyote can mate with a domestic dog (if the dog isn't killed and eaten first).

In his book, *The Ascent of Mind,* William H. Calvin observes: "In evolutionary arguments, it is no longer enough to demonstrate that something could have done the job, given enough time. By compound-interest reasoning, *any* slight advantage can eventually do the job. There are usually multiple ways to do the job, and the one that gets there first on the fast track tends to preempt the niche."

This is also true in human genetic engineering of domesticated animals. All we have to do is to look around us. In fact, the statement is also general when it comes to engineering development of any kind from simple machines to spaceships.

By perverting the genetic stock of domesticated animals, we have created niches for them in our lives. Few domesticated animals are members of an endangered species. In fact, people in the humane society's animal shelter will tell you that too many domesticated animals exist to fill the niches

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we've created for them.

However, many people live with intellectual blinders firmly affixed to concentrate their gaze, and therefore their perceptions, in a specific direction. In a way, they have become as specialized as a domesticated animal. They fail (or refuse) to see that we live in a very complex, interactive Universe. They need to learn from the meteorologist whose forecasts improved dramatically once he started looking out the window. The domestication of animals is one of these factors that is often overlooked because few of us grew up on farms. We are civilized, which means that we live together in cities—often not in a kind and gentle (civilized) fashion because one of the purposes of a city is to civilize its inhabitants by teaching them to live together. This is a perfect example of evolution in action.

However, when it comes to animals, humans have short-circuited evolution. For millennia, animals have been bred for specific physical characteristics and for intelligence or lack thereof. We and our ancestors are and were outstanding genetic engineers, albeit very empirical. One has only to look around.

Of course, this doesn't work with human beings, does it?

Given the current controversy about these matters, I suspect this will ring a bell for some people and throw a curve to others. ■

Space will not always be opened by leaving it to another generation.

—Dr. William A. Gaubatz
(Submitted by Marianne J. Dyson)

The only prize much cared for by the powerful is power. The prize of the general is not a bigger tent, but command.

—Oliver Wendell Holmes, Jr.

The things most people want to know are usually none of their business.

—Mark Twain

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Probability Zero

Jerry Oltion

AWAY IN A MANGER

The front window of Bob's Budget Time Tours looked like an abandoned movie theater. Faded posters of bygone eras covered the inside of the glass, and dead flies peppered the sill below them. The only evidence of recent decoration was a bright red Christmas ornament hanging from the bottom of a hand-lettered sign taped to the glass at eye level. Ordinarily Duncan wouldn't even have slowed down as he and his wife, Cynthia, walked past, but the sign caught his attention:

Nativity special
Round trip package, $50,000
Limited Space—reserve now!

"Limited space," Duncan said aloud. "I should certainly think so."

Cynthia laughed. "It's some sort of scam. Sure, look, it doesn't say *Christ's* nativity. They're probably selling chances for people to witness their own births."

Duncan said, "Fifty thousand is awfully steep for that."

"True," Cynthia admitted. Time visits to events of only personal significance were usually pretty cheap. "Still," she said, "it can't be the real thing."

That was true enough. The birth of Christ had been sold out for years. Likewise the crucifixion, the resurrection, and the sermon on the mount. After all, there had been only so many real people in attendance at those events, so there were a limited number of slots for time travelers. Rumor had it that the entire city of Jerusalem had been bought off the first year time tours became possible, and that the Pope himself had paid over twenty million to take the place of one of the Wise Men. Duncan didn't doubt that for a minute, nor the rumor that Leona Helmsley had paid almost that much for the privilege of telling Mary and Joseph that there was no room at the inn.

"Fifty thousand, eh?" Duncan rubbed his beard the way he did when he was thinking. "That's still not small change. I wonder whose

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birth they're selling for fifty grand."

"Come on," Cynthia said. "We'll be late for the concert."

"We can pay the extra few dollars for a ten-minute loopback. Come on, I'm curious." He pushed open the weathered wooden door and drew Cynthia along behind him into the dim interior.

An elderly man in a rumpled suit the same gray color as his hair looked up from a pile of papers on his desk. "Help you folks?" he asked.

"Your sign," Duncan said. "Certainly not *the* nativity?"

"The one and only," the man said, suddenly smiling. "And let me tell you, it's a bargain. Probably the last vacant spots *ever*. Once they're gone, they're gone."

Duncan asked, "So what are you doing selling them for fifty grand?"

The travel agent—Richard Fenwick, by the nameplate on his desk—leaned back in his chair and put his hands behind his head. "Beatin' the competition, baby. I'm the one who found the openings, but the moment word gets out they exist, one of the big agencies'll snap 'em up like nothin'. I figure it's use 'em or lose 'em, but my clientele ain't exactly rollin' in the dough, if you know what I mean, so I figure on sellin' 'em fast and cheap, make a few bucks and give a nice couple like you the chance of a lifetime." He waved at the two chairs on the customers' side of his desk.

Duncan held one for Cynthia, then sat in the other. "I can't believe there's an open position at the nativity. Who is it, a stablehand nobody knew about before? A maid at the inn who sneaks out for a romp in the hay?"

Fenwick grinned. "Can't tell you. All I can say is I got seven slots available, all with an excellent view of the manger. Better than some that sold for millions."

"Wow," Duncan whispered. "The nativity for fifty grand. Well, a hundred," he amended quickly, smiling at Cynthia.

She didn't smile back. "Duncan, we'd have to mortgage the house. And besides, I don't want to take a time tour. You have to learn every move the person you replace is supposed to make, and follow the script exactly, or you create paradoxes."

Fenwick shook his head. "No scripts, and no paradoxes."

"How?" Cynthia gave him her cold, no-nonsense stare.

He licked his lips nervously. "All right, I'll tell you this much: There's no body transfer involved. Only your mind will make the trip. You'll be an overlay in another body." He held up his hand, forestalling her protest. "No, you won't have trouble with multiple minds in one body; you'll each get one all to yourself."

"How can that be?"

Fenwick shook his head. "That stays secret until you get back. I don't want anybody else stealin' my hosts before I sell all seven tickets."

Duncan reached for his wallet. "We're in."

"Duncan!"

"Listen, we can make it back in a week from TV appearances alone. There hasn't been a new eyewitness report of the nativity for a decade."

Fenwick beamed. "Now that's what

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I call thinkin' ahead. I like your style, buddy." He slid a contract across the desk. "Sign here."

The transfer process was simple enough. A technician attached a bulky headset to each of the travelers, plugged them into a modified time machine, set the dials, and threw the lever. The travel agency faded away, and the dark interior of a candle-lit stable grew distinct around them. Sure enough, there stood the young Mary and Joseph, smiling nervously at the throng of time travelers disguised as shepherds and wise men who knelt before the straw-filled manger.

Duncan couldn't see the baby. He was on his hands and knees, but when he tried to sit up he staggered sideways and fell. "Damn!" he said, momentarily forgetting where he was. His body felt awkward. Had Fenwick put him into a drunk? When he looked around for a clue, he realized he was in among the sheep. Hiding? Or—he craned his neck to see his own body.

"That son of a bitch!" he shouted.

One of the wise men leaped back, startled. "It spoke," he whispered. "It's a miracle!"

"Miracle, schmiracle," one of the shepherds said. He whacked Duncan on the back with his crook. "I don't care if you can talk," he hissed. "Show some respect." ■

A sunfish sometimes lays 300 million eggs. What are they trying to prove?

—Will Cuppy

Whether he likes it or not, man is the instrument of nature; it forces on him its character and appearance.

—Pablo Picasso

There is nothing so imprudent or so improvident as over-prudence or over-providence.

—Samuel Butler

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Allen Steele

THE GOOD RAT

There are alternatives to animal experiments. . . .

Illustration by William R. Warren, Jr.

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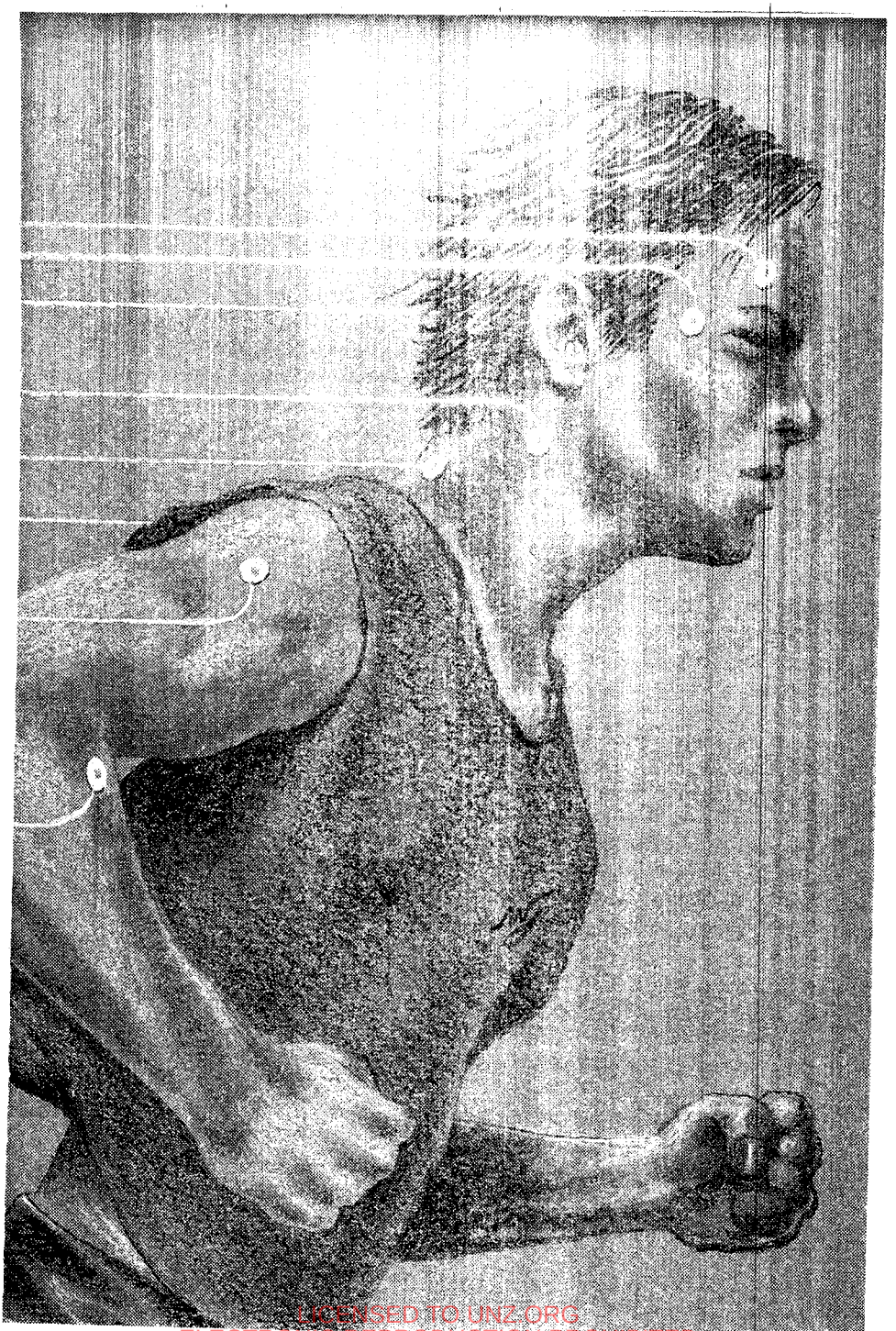

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Get home from spending two weeks in Thailand and Nepal. Nice tan from lying on the beach at Koh Samui, duffel bag full of stuff picked up cheap on the street in Kathmandu. Good vacation, but broke now. Money from mortgaging kidneys almost gone, mailbox full of bills and disconnect notices. Time to find work again.

Call agent, leave a message on her machine. She calls back that afternoon. We talk about the trip a little bit; tell her that I'm sending her a wooden mask. Likes that, but says she's busy trying to broker another couple of rats for experiments at Procter & Gamble. Asks why I'm calling.

Tell her I'm busted. Need work soon. Got bills to pay. She says, I'll work on it, get back to you soon, ciao, then hangs up on me. Figure I'll send her the ugliest mask in my bag.

Jet-lagged from spending last twenty-four hours on airplanes. Sleep next two days, watch a lot of TV in between. Mom calls on Tuesday, asks me where I've been for last month. Says she's been trying to find me. Don't tell her about Koh Samui and Kathmandu. Tell her I'm in night school at local college. Remedial English and basic computer programming. Learning how to do stuff with computers and how to read. She likes that. Asks if I got a job yet. About to lie some more when phone clicks. Got another call coming in, I say. Gotta go, bye. Just as well. Hate lying to Mom.

Agent on the phone. Asks if my legs are in good shape. Hell yeah, I say. Just spent ten days hiking through the Annapurna region, you bet my legs are in good shape. What's the scoop?

She say, private test facility in Boston needs a rat for Phase One experiments. Some company developing over-the-counter ointment for foot blisters. Need someone in good physical condition to do treadmill stuff. Two week gig. Think you can handle it?

Dunno, I say. Got a few bruises on thighs from falling down on rocks a lot. How much they pay? A hundred bucks a day, she says, minus her 15 percent commission. Not bad. Not great, but not bad either. Ask if they're buying the airplane ticket. She say, yeah, tourist class on Continental. I say, gee, I dunno, those bruises really hurt. First class on TWA would make them feel better. Says she'll get back to me, ciao, and hangs up.

Turn on TV, channel surf until I find some toons. Dumb coyote just fell off cliff again when agent calls back. She say, business class on TWA, OK? Think about trying to score box-seat ticket for a Red Sox game, but decide not to push my luck. Bruises feel much better, I say. When do they want me?

She say two days, I say OK. Tickets coming by Federal Express tomorrow, she says, but don't tell them about bruises, all right? Got no bruises, I say. Just wanted to get decent seat on the plane.

Calls me a name and hangs up again. Doesn't even say ciao this time. Decide not to send her a mask at all. Let her go to Kathmandu and buy one herself.

Two days later. Get off plane at airport in Beantown. Been here two

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years ago, when some other lab hired me to drink pink stuff for three days so scientists could look at what I pissed and puked. Like Boston. Nice city. Never figured out why they call it Beantown, though.

Skinny college kid at gate, holding cardboard sign with some word on it and my name below it. Walk up to him, ask if he's looking for me. Gives me funny look. He say, is this your name on the sign? I say, no, I'm Elmer Fudd, is he from the test facility?

Gets pissed. Asks for I.D. Show him my Sam's Club card. Got my picture on it, but he's still being a turd about it. Asks if I got a driver's license. Drop my duffel bag on his shoes, tell him I'm a busy man, so let's get going.

Takes me to garage where his Volvo is parked. No limo service this time. Must be cheap lab. Got limo service last time I did a job in Boston. Kid looks mad, though, so don't make Supreme Court case out of it.

Get stuck in tunnel traffic after leaving airport. Want to grab a nap in back seat, but the kid decides to make small talk. Asks me how it feels to be a rat.

Know what he's getting at. Heard it before. Say hey, dude, they pay me to get stuck with needles fifteen times a day, walk on treadmills, eat this, drink that, crap in a kidney tray and whizz in a bottle. It's a living, y'know?

Smiles. Thinks he's superior. Got a college degree that says so. He say, y'know, they used to do the same thing to dogs, monkeys, and rabbits before it got outlawed. How does it feel to be treated like an animal?

No problem, I say. You gotta dog at home you really like? Maybe a cat? Then bring him over to your lab, make him do the stuff I do, and half as well. Then you tell me.

Then he goes and starts telling me about Nazi concentration camp experiments. Heard that before too, usually from guys who march and wave signs in front of labs. Same guys who got upset about dogs, monkeys and rabbits being used in experiments are now angry that people are being used instead. Sort of makes me wonder why he's working for a company that does human experiments if he thinks they're wrong. Maybe a college education isn't such a great thing after all, if you have to do something you don't believe in.

Hey, the Nazis didn't ask for volunteers, I say, and they didn't pay them either. There's a difference. Just got back from spending two weeks in Nepal, hiking the lower Himalayas. Where'd you spend your last vacation?

Gets bent out of shape over that. Tells me how much he makes each year, before taxes. Tell him how much I make each year, after taxes. Free medical care and all the vacation time I want, too.

That shuts him up. Make the rest of the trip in peace.

Kid drives me to big old brick building overlooking the Charles River. Looks like it might have once been a factory. Usual bunch of demonstrators hanging out in the parking lot. Raining now, so they look cold and wet. Courts say they have to stay fifty feet away from the entrance. Can't read their signs. Wouldn't mean did-

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dly to me even if I could. That's my job they're protesting, so if they catch the flu, they better not come crying to me, because I'm probably the guy who tested the medicine they'll have to take.

Stop at front desk to present I.D., get name badge. Leave my bags with security guard. Ride up elevator to sixth floor. Place looks better on the inside. Plaster walls, tile floors, glass doors, everything painted white and gray. Offices have carpets, new furniture, hanging plants, computers on every desk.

First stop is the clinic. Woman doctor tests my reflexes, looks in my ears, checks my eyes, takes a blood sample, gives me a little bottle and points to the bathroom. Give her a full bottle a few minutes later, smile, ask what she's doing two weeks from now. Doesn't smile back. Thanks me for my urine.

Kid takes me down the hall to another office. Chief scientist waiting for me. Skinny guy with glasses, bald head and long bushy beard. Stands up and sticks out his hand, tells me his name. Can't remember it five minutes later. Think of him as Dr. Bighead. Just another guy in a white coat. Doesn't matter what his name is, so long as he writes it at the bottom of my paycheck.

Dr. Bighead offers me coffee. Ask for water instead. Kid goes to get me a glass of water, and Dr. Bighead starts telling me about the experiment.

Don't understand half the shit he says. It's scientific. Goes right over my head. Listen politely and nod my head at the right times, like a good rat.

Comes down to this. Some drug company hired his lab to do Phase One tests for its new product. It's a lotion to relieve foot blisters. No brand-name for it yet. Experiment calls for me to walk a treadmill for eight hours the first day with a one-hour break for lunch, or at least until I collect a nice bunch of blisters on the soles of my feet. Then they'll apply an ointment to my aching doggies, let me rest for twelve hours, but put me on the treadmill again the next day. This will be repeated every other day for the next two weeks.

Do I get paid for the days I'm not on the treadmill?

Of course, he says, but you have to stay here at the test facility. Got a private room in the dorm for you upstairs. Private cafeteria and rec room, too.

Does it have a pool table?

Got really nice pool table, he says. Also a VCR and a library. Computer, too, but no fax or modem. Company has strict policy against test participants being permitted open contact with outside world. Phone calls allowed, but they're monitored by security operators. Can receive forwarded mail, but all outgoing mail has to be read by a staff member first.

Nod. Been through this before. Most test facilities work this way. Sounds reasonable, I say.

When you're not on the treadmill, he says, you have to be in bed or in a wheelchair. No standing or walking, except when you're in the shower or going to the bathroom.

Shrug. Not a big deal. Once lay in bed for three days, doing nothing but

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watch old Flintstones cartoons on closed-circuit TV. Some kind of psychiatric experiment for UCLA. Ready to shout yabba-dabba-do and hump Betty Rubble by the time it was over. After that, there's nothing I can't do.

Dr. Bighead stops smiling now. Folds hands together on desk. Time for the serious stuff now.

The ointment we put on your feet may not be the final product, he says. May have to try different variations on the same formula. Side-effects may include persistent itching, reddening or flaking of the skin, minor swelling. Computer simulations of the product have produced none of these results, but this is the first time the product has undergone Phase One testing.

Nod. Been there, done that.

Goes on. Tells me that there's three other volunteers doing the same experiment. Three of us will be the test subjects, the other one the control subject who receives a placebo. We won't know in advance who gets the product and who gets the placebo. Do I understand?

Test subjects, control subjects, placebos, and my feet may rot and fall off before this is all over. Got it, doc. Sounds cool.

Dr. Bighead goes on. If any of this bothers me, I can leave now, and his company will pay me a hundred dollars for one day of my time and supply me with airfare back home. However, if I chicken out during the test period, or if I'm caught trying to wash off the ointment, they'll throw me out of the experiment and I won't be paid anything.

Yeah, uh-huh. He has to tell me this because of the way the laws are written. Never chickened out before, I say. Sounds great to me. When do we get started?

Dr. Bighead grins. Likes a nice, cooperative rat. Tomorrow morning, he says. Eight o'clock sharp.

Ask if I can go catch a little nightlife tonight. Frowns. Tells me I may have to submit another urine sample if I do so. Nod my head. No problem. He shrugs. Sure, so long as you're back by midnight. After that, you're in here until we're through with the experiment.

No problem.

Spend another hour with contracts and release forms. Dr. Bighead not surprised that I don't read very well. Must have seen the file my agent faxed his company. Make him read everything aloud, while I get it all on the little CD recorder I brought with me. Agent taught me to do that. Means we can sue his company if it pulls any funny stuff. Maybe this rat can't read, but he's still got rights.

Everything sounds cool. Sign all the legal stuff. Dr. Bighead gives me plastic wristband and watches me put it around my left wrist, then lets me go. Notice that he doesn't shake hands again. Maybe afraid he'll catch functional illiteracy.

Same kid waiting outside. Takes me up to dorm on the seventh floor.

Looks like a hospital ward. No windows. Six private rooms surrounding a rec area. Small cafeteria off to one side. Couple of tables, some chairs and sofas. Bookshelf full of old paperbacks and magazines. Fifty-two inch flatscreen TV, loads of videos on the

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rack above it. Pay phone in the corner. Pool table, though it looks like a cheap one. Look up, spot fish-eye camera lens hidden in the ceiling.

Same as usual. Could be better, could be worse.

Room is small. Single bed, desk, closet. No windows here either, but at least it's got a private bathroom. Count my blessings. No roommate this time. Last one snored, and the one before that went nuts six days into the experiment and was punted.

My bag is on the bed. Notice zipper is partly open. Been searched to make sure I didn't bring in any booze, dope, butts, or cellular phones.

Kid tells me he's got to go. Reminds me not to leave without my badge. See you tomorrow, I say.

Unpack bag, leave room. Want to get a bite to eat and check out the night life.

Two people sitting in the rec room now, watching TV news. A guy and a woman. Guy looks like he's about thirty. Thin, long-haired, sparse beard. Paperback book spread open on his lap. Barely glances my way.

The woman is different. Another rat, but the most beautiful rat I've seen in a while. Long brown hair. Slender but got some muscles. Good-looking. My type.

Catch her eye as I walk past. Give her a nod. She nods back, smiles a little. Doesn't say anything. Just a nod and smile.

Think about that nod and smile all the way to the elevator.

Found a good hangout last time I was in Boston, over in Dorchester. Catch a rickshaw over there now.

Sign above the door says No * Allowed. First time I was here, someone had to read the name to me, then explain that the symbol in the middle is an asterisk. What part of your body looks like an asterisk? Still don't get it, I say. Laughs and says, bend over, stick your head between your legs and look harder. Get it now, I say.

Can smoke a butt inside wherever you want, if you can find a butt to smoke these days. Fifty-six brands of beer. Not served only in the basement, but at your table if you want. Hamburgers, hot dogs, chicken-fried steak and onion rings on the menu. No tofu pizza or lentil soup. Framed nude photos of Madonna, Keith Moon, Cindy Crawford, and Sylvester Stallone on the walls. Antique Wurlitzer jukebox loaded with stuff that can't be sold without a parental warning sticker on the cover.

No screaming kids, either.

Cops would shut down this place if most people knew it existed. Or maybe not. Several guys hanging out at the bar look like off-duty cops. Cops need a place to have a smoke and drink, too, y'know.

Good bar. Should be a place like this in every city. Once there was, before everyone took offense to everything and no one could stay out of other people's business. Laws got passed to make sure that you had to live in smoke-free, low-cholesterol, non-alcoholic, child-safe environments. Now you have to go slumming to find a place where no *s are allowed.

Cover charge, tonight, though.

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Can't have everything.

Find seat near the stage, order ginger ale, watch some nuevo-punk band ruin old Romantics and Clash numbers. It's Boston, so they're obligated to do something by the Cars. Probably toddlers when Ric Ocasek was blowing speakers.

Usually have a blowout the night before an experiment. Never binge, but have good fun anyway. Lots of babes here tonight, most of them with guys who look like they should be home wanking off on Internet. A couple of their girlfriends throw gimme looks in my direction.

Should do something about it. Still early. Can always get a hotel room for a few hours. Use the line about being a biomedical research expert in town for an important conference. Babes love sleeping with doctors.

Heart not into it. Keep thinking about the girl in the rec room. Don't know why. Just another rat.

Find myself looking around every time the door opens, hoping she'll walk in.

Leave before eleven o'clock, alone for once. Tell myself it's because the band was dick. Know better.

On the way back to the test center, wonder if Mom's not right. Maybe time to get a job. Learn how to read, too.

Bet she knows how to read.

Eight o'clock next morning. Come downstairs wearing my rat gear. Gym shorts, football jersey, sneaks. Time to go to work for the advancement of science and all mankind.

Dr. Bighead is waiting for me. Not as friendly as he was yesterday. Takes me to clinic and waits while I fill another bottle for the doctor. Escorts me to the lab.

Four power treadmills set next to each other on one side of the room, with a TV hanging from the ceiling above them. Stupid purple dinosaur show on the tube. Sound turned down low. College kids wearing white coats sitting in front of computers on other end of the room. One of them is the guy who picked me up at the airport. Glances up for a second when I come in. Doesn't wave back. Just looks at his screen again, taps fingers on his keyboard. Too cool to talk to rats now.

Two other rats sitting in plastic chairs. Already wired up, watching Barney, waiting to go. Walk over to meet them. One is the skinny longhair I saw last night. Wearing old Lollapolooza shirt. Name's Doug. Other guy looks like he works out a lot. Big dude. Shaved head, nose ring, truck stop tattoo on right forearm. Says his name is Phil.

Doug looks bored, Phil nervous. Everyone swats hands. We're the rat patrol, cruising for a bruising.

Time to get wired. Sit on table, take off shirt, let one of the kids tape electrodes all over me. Head, neck, chest, back, thighs, ankles. So much as twitch and lines jump all over the computer screens. Somebody asks what I had for breakfast, when was the last time I went to the bathroom. Writes it all down on a clipboard.

Phil asks if the TV has cable. Please change the channel, he says, it's giving me a headache. No one pays at-

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tention to him. Finally gets up and switches over to *The Today Show*. Dr. Bighead gives him the eye. Wonder if this is the first time Phil has ever been on the rat patrol. If the scientists want you to watch Barney, then you do it, no questions asked. Could be part of the experiment for all you know.

Don't mess with the scientists. Everyone knows that.

Last rat finally arrives. No surprise, it's the girl I saw last night. Wearing one-piece workout suit. Thank you, Lord, for giving us the guy who invented Spandex. Phil and Doug look ready to swallow their tongues when they see her. Guy who tapes electrodes to her gets a woody under his lab coat when he goes to work on her chest and thighs.

She ignores his hands, just like she ignores everyone else, including me and the boys. She's a true-blue, all-American, professional rat.

Time to mount the treadmills. Dr. Bighead makes a performance about us getting on the proper machines, as if it makes a difference. The girl is put on the machine to my left, with Doug on my right and Phil next to him.

Grasp the metal bar in front of me. Dr. Bighead checks to make sure that the computers are up and running, then he switches on the treadmills. Smooth rubber mat beneath my feet begins to roll at a slow pace, only about a foot or so every few seconds. My grandmother could walk faster than this.

Look over at the girl. She's watching Willard Scott talking to some guy dressed like a turkey. Asks Dr. Bighead if he'd turn up the volume. He say no, it would just distract his team. Think he's pissed because Phil switched off the purple dinosaur.

Just as well. Gives us a chance to get acquainted.

She starts first. Asks me my name. Tell her. She nods, tells me hers. Sylvie Simms. Hi Sylvie, I say, nice to meet you.

Scientists murmur to each other behind our backs. Sylvie asks me where I'm from. She tells me she's from Columbus, Ohio.

C'mon, man, Phil says. Turn up the volume. Can't hear what he's saying about the weather.

Dr. Bighead ignores him.

Look over at Doug. Got a Walkman strapped to his waist. Eyes closed, head bobbing up and down. Grooving to something in his headphones as he keeps on trucking.

Been to Columbus, I say. Nice city. Got a great barbecue place downtown, right across the street from the civic center.

Sylvie laughs. Got a nice laugh. Asks if it's a restaurant with an Irish name. Yeah, I say, that's the one. Serves ribs with a sweet sauce. She knows the place, been there many times.

And so we're off and running. Or walking. Whatever.

Doug listens to rock bands on his Walkman, getting someone to change CDs for him every now and then. Phil stares at the TV, supplying his own dialogue for the stuff he can't hear, bitching about not being able to change the channel. A kid walks by every now and then with a bottle of water, letting us grab a quick sip

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through a plastic straw.

Sylvie and I talk to each other.

Learn a lot about Sylvie while waiting for the blisters to form. Single. Twenty-seven years old. Got a B.A. in elementary education from the same university where I got my start as a rat, but couldn't get a decent job. Public schools aren't hiring anyone who don't have a military service record, the privates only take people with master's degrees. Became a rat instead, been running for two years now. Still wishes she could teach school, but at least this way she's paying the rent.

Tell her about myself. Born here. Live there. Leave out part about not being able to read very well, but truthful about everything else. Four years as a rat after doing a stint in the Army. Tell her about other Phase One tests I've done, go on to talking about places I've gone hiking.

Gets interested in the last part. Asks me where I've been. Tell her about recent trek through Nepal, about the beach at Koh Samui where you can go swimming without running into floating garbage. About hiking to the glacier in New Zealand and the moors in Scotland and rain forest trails in Brazil.

You like to travel, she says.

Love to travel, I say. Not first-class, not like a tourist, but better this way. Get to see places I've never been before.

Asks what I do there. Just walk, I say. Walk and take pictures. Look at birds and animals. Just to be there, that's all.

Asks how I've been able to afford to do all this. Tell her about mortgaging my organs to organ banks.

Looks away. You sell your organs?

No, I say, I don't sell them. Mortgage them. Liver to a cloner in Tennessee, heart to an organ bank in Oregon, both lungs to a hospital to Texas. One kidney to Idaho, the other to Minnesota. . . .

Almost stops walking when she hears that. You'd sell them your whole body?

Shrug. Haven't sold everything yet, I say. Still haven't mortgaged corneas, skin, or veins. Saving them for last, when I'm too old to do rat duty and can't sell plasma, bone marrow or sperm anymore.

She blushes when I mention sperm. Pretend not to notice. She asks if I know what they're going to do with my organs when I'm dead.

Sure, I say. Someone at the morgue runs a scanner over the bar-code tattoo on my left arm. That tells them to put my body in a fridge and contact the nearest organ donor info center. All the mortgage-holders will be notified, and they'll fly in to claim whatever my agent negotiated to give them. Anything left over afterwards, the morgue puts it in the incinerator. Ashes to ashes and all the happy stuff.

Sylvie takes a deep breath. And that doesn't bother you?

Shrug. Naw, I say. Rather have somebody else get a second chance at life from my organs than having them rot in a coffin in the ground. While they're still mine, I can use the dough to go places I've never been before.

Treadmill is beginning to run just a little faster now. No longer walking at a granny pace. Dr. Bighead must be

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getting impatient. Wants to get some nice blisters on our feet by the end of the day.

Phil sweats heavily now. Complains about having to watch Sally Jesse instead of Oprah. Don't wanna watch that white whore, he says. C'mon, gimme that black bitch instead. Doug sweating hard, too, but just keeps walking. Asks for a Smashing Pumpkins CD, please. One of the kids changes his CD for him, but doesn't switch channels on the TV.

Couldn't do that, Sylvie says. Body too precious to me.

Body precious to me, too, I say, but it ain't me. Gone somewhere else when I'm dead. Just meat after that. Why not sell this and that while you're still around?

She's quiet for a long while. Stares at the TV instead. Sally Jesse is talking to someone who looks like a man dressed as a woman but looks like a woman trying to resemble a man, or something like that.

Maybe I shouldn't have told her what I think about organ mortgages. Being a rat is one thing, but putting your innards on the layaway plan is another. Some people don't get it, and some of the ones who get it don't like it.

Sylvie must know this stuff. All rats do. Most of us sign mortgages. So what's her problem?

Bell dings somewhere behind us. Time for lunch. Didn't even notice that it was noon yet. Dr. Bighead comes back in, turns off treadmills. Gets us to sit on examination tables and take off shoes. No blisters on our feet yet, but he still puts us in wheelchairs. OK, he says, be back here by one o'clock.

Can't wait, Phil says.

Lunch ready for us in rec room. Chicken soup, grilled cheese sandwiches, tuna salad. Push our way down the service line, carrying trays on our laps, reaching up to get everything. Been in a wheelchair before, so has Doug and Sylvie, but Phil not used to it. Spills hot soup all over his lap, screams bloody murder.

Share a table with Sylvie. Newspapers on table for us to read. Intern brings us mail forwarded from home. Bills and junk for me, but Sylvie gets a postcard. Picture of tropical beach on the front.

Ask who it came from. Her brother, she says. Ask where her brother lives, and she passes me the postcard.

Pretend to read it. Only big word I know is Mexico. Always wanted to visit Mexico, I say. What does he do down there?

Hesitates. Business, she says.

Should shut up now, but don't. What kind of business?

Looks at me funny. Didn't you read the card?

Sure, sure, I say. Just asking.

Thinks about it a moment, then she tells me. Younger brother used to live in Minneapolis, but was busted by the feds early last year. Sold cartons of cigarettes smuggled from Mexico out of the back of his car. Smoking illegal in Minneapolis. Felony charge, his third for selling butts on the street. Three-strikes law means he goes to jail for life. For selling cigarettes.

Judge set bail at seven grand. Sylvie

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came up with the cash. Brother jumped bail, as she knew he would. Fled south, sought amnesty, went to work for Mexican tobacco company. Sends her postcard now and then, but hasn't seen him in almost two years.

That's tough, I say. She nods. Think about it a little. Question comes to mind. How did you come up with seven grand so fast?

Doesn't say anything for a minute, then she tells me.

Got it from mortgaging her corneas.

Five is the usual price, but she got seven on the overseas black market. When she dies, her eyes go to India. At least it kept my brother from going to prison, she says, but I can tell that isn't the point.

Sylvie doesn't want to be buried without her eyes.

She takes back the postcard, turns it over to look at the beach on the front. Kind of makes you want to visit Tijuana, doesn't it?

Tijuana looks like a great place, I say. Always wanted to go there. At least he's found a nice place to live.

Gives me long, hard look. Card wasn't sent from Tijuana, she says. It's from Mexico City, where he's living now. That's in the letter. Didn't you read it?

Oh, I say. Yeah, sure. Just forgot.

Doesn't say anything for a moment. Pulls over the newspaper, looks at the front page. Points at a headline. Says, isn't that a shame?

Look at picture next to it. Shows African woman with a dead baby in her arms, screaming at camera. Yeah, I say, that's tough. Hate it when I read news like that.

Sylvie taps a finger on the headline. Says here that the unemployment rate in Massachusetts is lowest in fifteen years, she says.

Oh yeah, I say. That's not what I meant. That's good news, yeah.

Pushes newspaper aside. Looks around to see if anyone is listening. Drops her voice to a whisper. You can't read, can you?

Face turns warm. No point in lying to her. She knows now.

Only a little, I say. Just enough to get by, like a menu or a plane ticket. Not enough to read her brother's postcard or a newspaper.

Feel stupid now. Want to get up and leave. Forget that I'm supposed to stay in the wheelchair, start to rise to my feet. Sylvie puts her hand on top of mine, makes me stay put.

It's OK, she says. Doesn't matter. Kind of suspected, but didn't know for sure until you asked me about what my brother said in his letter.

Still want to leave. Grab rubber wheels, start to push back from table.

C'mon, don't go away, she says. Didn't mean to embarrass you. Stay here.

Feel like an idiot, I say.

Sylvie shakes her head. Gives me that smile again. No, she say, you're not an idiot. You're just as smart as anyone else.

Look at her. She doesn't look away. Her eyes are owned by some company in India, but for a moment they belong only to me.

You can learn how to read, she says. You've just never had a teacher like me.

Get blisters on my feet by end of

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first day. Same for the other guys. Dr. Bighead very pleased. Never seen someone get so excited about blisters. Wonder if he's got a thing for feet.

Scientists take pictures of our feet, make notes on clipboard, then spread lotion on our soles. Pale green stuff. Feels like snot from a bad head cold, smells like a Christmas tree soaked in kerosene. Use eyedroppers to carefully measure the exact amount. Should have used paintbrushes instead.

Everyone gets theirs from different bottles. No idea if I got the test product or the placebo, but blisters feel a little better after they put it on.

Doesn't last long. Skin begins to itch after dinner. Not bad itch, but can't resist scratching at the bottom of my feet. Sort of like having chigger bites from walking in tall grass. Sylvie and Phil have the same thing, but Doug doesn't. Sits in corner of rec room, reading paperback book, never once touching his feet. Rest of us watch the tube and paw at our tootsies.

Guess we know who got the placebo.

No treadmill work the next day, but we go back down to the lab after breakfast and let the scientists examine us some more. Tell them about the itching while they draw blood samples. They nod, listen, take more pictures, make more notes, then put more green stuff on our feet.

Different formula this time. Now it's Extra Strength Green Stuff. Must be made out of fire ants. Nearly jump off the table. Sylvie hisses and screws up her eyes when they put it on her. Phil yells obscenities. Two guys have to grab him before he decks the kid who put it on his feet.

Feet still burning when we go back upstairs. Sylvie goes to her room. Doug picks up his book and reads. Phil mad as hell, pissing and moaning about Dr. Bighead. Says he only did this to get a little extra dough, didn't know they were going to put him in jail and torture him to death. Says he wants to go put his feet in a sink.

Don't do it, I say, it'll screw up the test. Tell him that trying to punch out a scientist is way uncool. Calm down, dude. Let's play some eight-ball. Get your mind off it.

Mumbles something under his breath, but says, yeah, OK, whatever.

Hard to shoot pool sitting in wheelchairs, but we manage for awhile. Phil can't get into it. Blows easy shots, scratches the cue ball twice. Sinks eight-ball when I've still got four stripes on the table. Loses temper. Slams his stick down on table, turns chair around and rolls off to his room. Slams the door.

Look up at lens in the ceiling. Know someone must be catching all this.

Go over to TV, turn it on, start watching Oprah. Sylvie comes over a little while later. Asks if I want to begin reading lessons.

Not much into it, I say. Wanna watch Oprah instead.

Gives me a look that could give a woody to a monk. C'mon, she says. Please. I'd really like it if you would.

Think maybe I can score some points with her this way, so I go along with it. What the hell. Maybe I might learn something.

OK, I say.

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Turns off TV, wheels over to bookshelf, starts poking through it. Think she's going to grab a book or a magazine. Can't even read the titles of most of them. If she brings back Shakespeare or something like that, I'm outta here.

Picks up a bunch of newspapers from the bottom shelf. Puts them in her lap, hauls them over to a table, tells me to come over next to her.

Finds the funny pages. Asks me if I like comic strips. Naw, I say. Never really looked at them. Smiles and says she reads the funnies every morning. Best part of her day. She points to the one at the top of the first page. Here's one I like, she says. Tell me what this little kid is saying to the tiger.

That's how I start to learn how to read. Seeing what Calvin and Hobbes did today.

After lunch, we go down to the lab again for another checkup. Feet no longer burning, but the itch is back. Feet a little red. More blood samples, more photos, more notes. More ointment on our feet. Doesn't burn so much this time. Looks a little different, too. Must be New Improved Extra Strength Green Stuff.

Scientists notice something different when they look at Phil's feet. Spend a lot of time with him. Compare them to photos they took earlier. One of them takes a scalpel, scrapes a little bit of dead skin off the bottom of each foot, puts it in a dish, takes it out of the room.

Phil keeps saying, what's going on? What's the big deal? Gotta right to know.

Scientists say nothing to him. Examine Sylvie and Doug, spread more ointment on their feet, then let the three of us go back to the dorm. Tell Phil he has to stay behind. Say they want to conduct a more thorough examination.

Dr. Bighead walks past us while we're waiting for the elevator. Just says hi, nothing else. Goes straight to the lab, closes door behind him.

Phil screwed up, I say to Doug and Sylvie when we're alone in the elevator. Don't know how, but I think he screwed up.

Just nod. Know the score. Seen it before, too. People go crazy sometimes during a long test. Happens to new guys all time. Every now and then, some dumb rat gets washed down the gutter.

Return to rec room. Doug picks up his paperback, Sylvie and I go back to reading the funnies. Trying to figure out why Sarge just kicked Beetle in the butt when door opens and Phil comes in. Not riding a wheelchair now. Dr. Bighead and a security guard are right behind him.

Doesn't say much to us, just goes straight to his room and collects his bag. Leaves without saying goodbye or anything.

Dr. Bighead stays behind. Says that Phil was dismissed from the experiment because he scrubbed off the product. Also displayed lack of proper attitude. Won't be replaced because it's too late to do so without beginning the tests again.

We nod, say nothing. No point in telling him that we were expecting this. Warns us not to do the same

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thing. Phil isn't being paid for his time, he says, because he violated the terms of his contract.

Nod. No sir. We're good rats.

Apologizes for the inconvenience. Asks us if we need anything.

Sylvie raises her hand. Asks for some comic books. Dr. Bighead gives her a weird look, but nods his head. Promises to have some comic books sent up here by tomorrow. Then he leaves.

Doug looks up from his book as the door shuts behind him. Good, he says. Leaves more green stuff for us.

Two weeks go by fast.

Phase One tests sometimes take forever. Drives everyone crazy. This one should, because we're not on the treadmills every single day and have lots of time on our hands, but it doesn't.

For once, I'm doing something else besides staring at the tube. Usually spend hours lying on a couch in the rec room, watching one video after another, killing time until I go to the lab again.

But not now.

After work and on the off-days, I sit at a table with Sylvie, fighting my way through the funny pages.

Sometimes Doug helps, when Sylvie needs to sleep or when her feet are aching too much. Both are patient. Don't treat me like a kid or a retard or laugh when I can't figure out a long word, and help me pronounce it over and over again until I get it right. If it's something difficult, Sylvie describes what it means in plain English, or even draws a little picture. Take notes on stationery paper and study them at night until I fall asleep.

Able to get through the funny pages without much help after the first few days, then we start on the comic books Dr. Bighead got for us. Archie and Jughead at first, because they're simple. When Sylvie isn't around, Doug and I get into discussing who we'd rather shag, Betty or Veronica, but pretty soon I'm tackling Batman and the X-Men. Find out that the comics are much better than the movies.

Doug is a good teacher, but I prefer to be with Sylvie.

Funny thing happens. Start to make sense of the newspaper headlines. They're no longer alien to me. Discover that they actually mean something. Stuff in them that isn't on TV.

Then start to figure out titles on the covers of Doug's books. Know now that he likes science fiction and spy novels. Better than movies, he says, and I believe him when he tells me what they're about. Still can't read what's on the pages, because I still need pictures to help me understand the words, but for the first time I actually want to know what's in a book.

Hard to describe. Sort of like hiking through dense rain forest, where you can't see anything except shadows and you think it's night, and you try to stay on the trail because you don't know what's out there. Then you get above the treeline and there's a clearing. Sun is right over your head and it's warm and we can see for miles, mountains and ranges and plains all spread out before you, and it's so beautiful you want to spend the rest

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of your life here.

That's what it's like. All of a sudden, I'm not as stupid as I once thought I was.

One night, after everyone else has gone to bed and the lights are turned off, I find myself crying. Don't cry easily, because that's not the way I was brought up. Dad beat the crap out of me if he caught me doing so, call me a faggot and a little girlie-boy. No short or easy way to explain it, but that's sort of why he took me out of school, made me go to work in his garage. Said he wanted me to be a man, that he didn't want no godless liberals messing up my brain with books and ideas.

When he dropped dead with a socket wrench in his hand, I was eighteen. Only thing in my wallet was a draft card I couldn't read. Time in the army showed me the rest of the world and made me want to see more, but by then was too late to go back to school. After that, only choice I had to stay alive and see the world was to become a rat. A rat whose body didn't belong to himself.

Something wrong when the law lets a human be a rat, because a rat has more respect than a human. Rats can't learn to read, but a human can. No one wants to spend money on schools, though. Rather spend it on building prisons, then putting people in there who sell cigarettes. Meanwhile, teachers have to go do things that they won't let rats do anymore.

Didn't cry that night for Sylvie or her brother, even though that was part of it. Cried for all the lost years of my life.

Spend last few days trying to learn as much as I can, but can't get past one thing.

Sylvie.

Started to learn how to read because I wanted to shag her. Going along with her seemed like the easiest way of getting her into bed.

Can't do that during an experiment, because sex with other rats is a strict no-no in the standard contract. Seen other rats get punted for just being caught in someone else's room, even when both persons had their pants on. When tests are over and everyone's paid, though, there's nothing wrong with a little party time at the nearest no-tell motel.

Still want to sleep with her. Get a Jackson sometimes just sitting next to her in the rec room, while she's helping me get through some word I haven't seen before. Can't take my eyes off her when she's running the treadmill next to me.

Different situation now, though. Isn't just about getting Sylvie in some cheap motel for some hoy-hoy. Not even about learning how to read. Got some scary feelings about her.

Two days before the end of the tests. Alone together in the rec room, reading Spider-Man to each other. Ask her straight. Say, hey, why are you helping me like this?

Keeps looking at comic book, but flips back her hair and smiles a little. Because I'm a teacher, she says, and this is what I do. You're the first pupil I've had since college.

Plenty of winos in the park who don't know how to read, I say. Could always teach them. Why bother with me?

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Gives me long look. Not angry, not cold. Can't quite make it out.

Because, she says, I've always wanted to visit Kathmandu, and maybe I've found someone who can take me there.

Can take you there, I say. Can take you to Nepal, Brazil, Ireland. Mexico to visit your brother, if you want.

Blushes. Looks away for a second, then back at me. Maybe you just want to take me to nearest hotel when we're done here, she says. I've done that. Wouldn't mind doing it again, either.

Shake my head. Like Kathmandu better, I say. Sunrise over Annapurna is incredible. Would love you to see it with me.

Love? Thought I was just teaching you how to read.

Look around to see if anyone is watching. No one there, but there must be someone behind the lens in the ceiling.

Hell with them. Put my hand under the table and find hers. One more word you've taught me, I say.

She smiles. Doesn't take her hand away. Finds a pen in her pocket, hands it to me, pushes some paper in front of me.

If you can write it, she says, I'll believe you.

Phase One test of the product pronounced a success on the final day. Last batch of Brand New Improved Green Stuff doesn't smell, doesn't itch, doesn't burn, and heals the blisters on our feet. Doesn't do a thing for our leg cramps, but that's beside the point.

Dr. Bighead thanks us, writes his name on the bottom of our checks. Tells us we've been wonderful test subjects. Hopes to work with us again soon. In fact, are you available next March? Scheduled test of new anti-depressant drug. Looking for subjects now. How about it?

Look at Sylvie. She's sitting next to me. Doesn't say anything. Look at the check. It's written on an account at the First Bank of Boston, and it's signed by Dr. Leonard Whyte, M.D.

Thank you, Dr. Whyte, I say. My agent will be in touch with you. Ciao.

A cab is waiting for us at the front door. We tell the driver to take us to the nearest hotel.

Three years have passed since Sylvie and I met in Boston. A few things are different now.

She finally managed to get me to use proper grammar instead of street talk. I'm still learning, but personal pronouns are no longer foreign to me, and it's no longer necessary to refer to all events in the present tense. To those of you who have patiently suffered through my broken English during this chronicle, I sincerely apologize. This was an attempt to portray the person I once was, before Sylvie came into my life.

We used the money earned during the Boston tests for a trip to Mexico City, where Sylvie got see her brother for the first time in two years. Six months later, we flew to Nepal and made a trek through the Annapurna region, where I showed her a sunrise over the Himalayas. Since then we have gone on a safari in Kenya and

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rafted down the Amazon. Now we're planning a spring trip to northern Canada, above the Arctic circle. A little too cold for my taste, but she wants to see the Northern Lights.

Anything for my baby.

The first night in Kathmandu, I promised to give her the world that I knew in exchange for hers. She has made good by her promise, and I'm making good by mine.

Nonetheless, we're still rats.

We can't marry, because the labs that supply our income won't accept married couples as test subjects. Although we've been living together for almost three years how, we keep addresses in different cities, file separate tax returns and maintain our own bank accounts. Her mail is forwarded to my place, and only our agents know the difference. We'll probably never have children, or at least until we decide to surrender this strange freedom that we've found.

Our freedom is not without price. I've mortgaged the last usable tissue in my body. Sylvie hasn't repossessed the rights to her corneas, despite her attempts to find a legal loophole that will allow her to do so, and although the time may come when she has to give up an organ or two, she insists that her body is her own.

More painful is the fact that, every so often, we have to spend several weeks each year participating in the Phase One tests. Sometimes they're the very same experiments, conducted simultaneously at the same test facility, so we have to pretend to be strangers.

I haven't quite become used to that, but it can't be helped.

But the money is good, the airfare is free, and we sometimes get to see old friends. We spent a week with Doug a couple of months ago, while doing hypothermia experiments in Colorado. He and I discussed favorite Jules Verne novels while sitting in tubs of ice water.

For all of that, though, I lead a satisfactory life. Sylvie and I have enough money to pay the bills, and we visit the most interesting places around the world. I have a woman who I love, my mother has stopped bothering me about getting a job, and I've learned how to read.

Not only that, but we can always say that we've done our part for the advancement of science and all mankind.

For what more can a good rat ask? ■

What we anticipate seldom occurs; what we least expected generally happens.

—Benjamin Disræli

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Conclusion

Lois McMaster Bujold

CETAGANDA

More and more, the most valuable commodity will be information. But what makes anything valuable?

Illustration by Mark Ferrari

SYNOPSIS

Lieutenant Lord **Miles Naismith Vorkosigan** *and his cousin Lieutenant Lord* **Ivan Vorpatril** *arrive in orbit at the planet of Eta Ceta, capital of the Cetagandan Empire, to be official Barrayaran envoys to the State funeral of the aged Dowager Empress* **Lisbet Degtiar**. *But their personnel pod, upon docking, is boarded by a stranger with no facial hair. Believing the intruder is drawing a weapon, they jump him. Miles relieves the stranger of a lethal nerve disruptor and a mysterious rod, apparently electronic in function, sealed by a code-lock patterned in the shape of a red bird. The intruder escapes. Miles pockets the spoils, assuming he will have to give them up shortly to the Cetagandan authorities. But after a second boarding the two young envoys are collected by the Barrayaran ambassador* **Lord Vorob'yev** *and whisked through Cetagandan customs with no questions asked.*

That evening, Vorob'yev takes them to a diplomatic reception at another embassy in the Cetagandan district. Miles meets **Mia Maz**, *an expert in women's protocol from the Vervani embassy, to whom he describes the seal-pattern from his mysterious rod; she identifies it as a Cetagandan cartouche, and promises to look up its provenance. An artistic young Cetagandan gben-lord named* **Yenaro** *escorts Miles*

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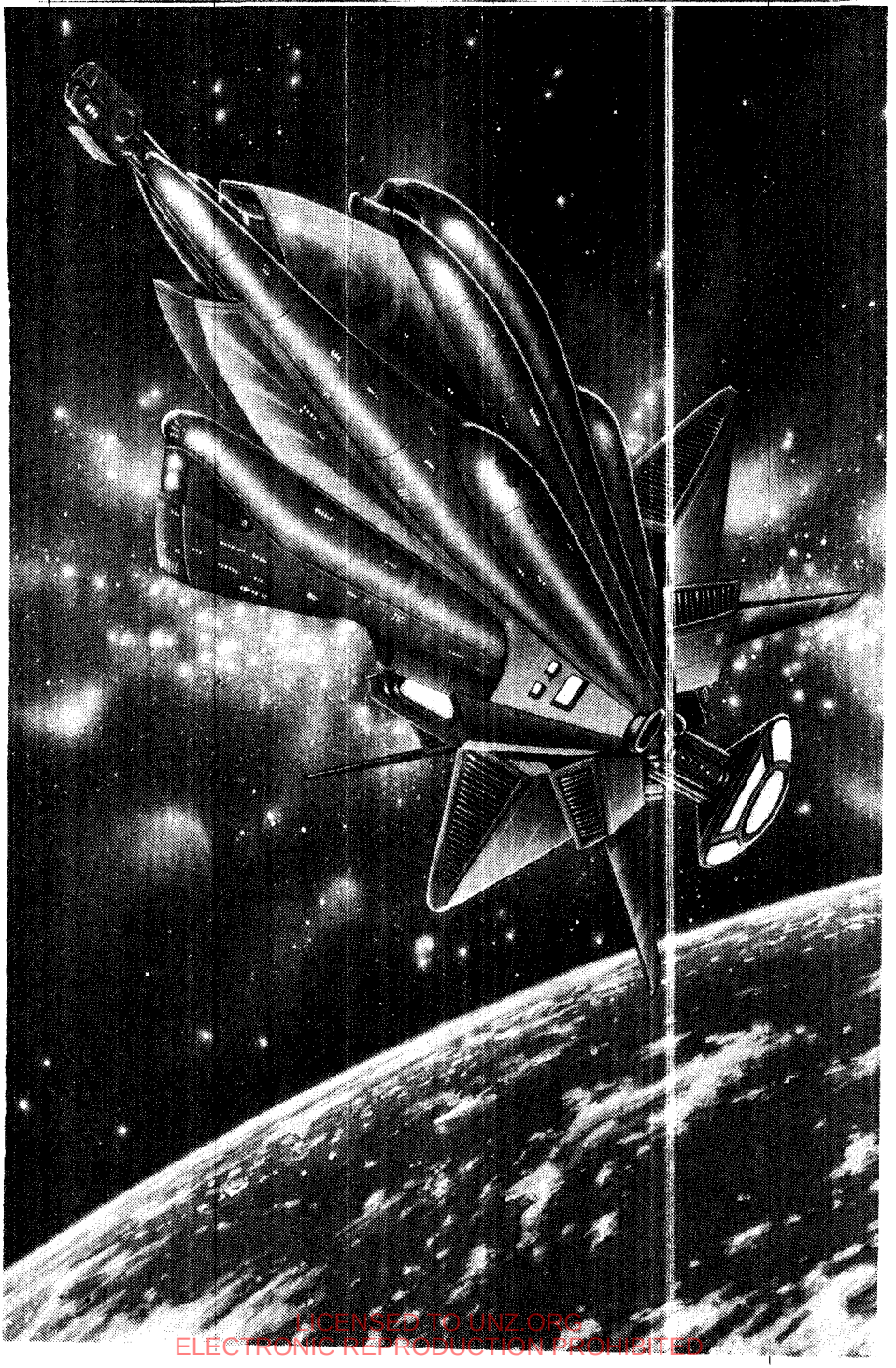

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on his metal leg-braces, bringing them up to skin-burning temperature. Miles yells and pelts out of the maze, making a public spectacle of himself, and convinced that the artwork was a subtle trap set just for him.

The next day Miles and Ivan attend the presentation of bier-gifts to the dead empress at the Celestial Garden, a great force-dome at the center of the city that houses the Cetagandan emperor and all Imperial panoply. A hairless palace servitor escorts Miles to a haut-lady who, as is customary, is totally concealed in an opaque white force-bubble, shielded from outlander eyes. The bubble introduces herself as the haut **Rian Degtiar**, *attendant to the late empress and Handmaiden of the Star Crèche. Miles learns from her that the hairless ones are called Ba, genderless genetically-engineered Imperial slaves of considerable status. After a very confused conversation, Miles realizes that the rod-shaped device is her property, and she is accusing him of stealing it. He hastily promises to return it.*

In the rotunda housing the empress's bier, the ceremony goes awry. Miles ducks through the line of ghem-guards around the catafalque to see what the problem is. He finds the dead body of an aged ba in the uniform of a palace sevitor, its throat cut by the knife in its right hand—their intruder from the docking bay. Miles learns it is the Ba Lura, one of the late empress's oldest and most trusted servitors, who has apparently suicided at her feet.

Back at the Barrayaran embassy, Mia Maz gives Miles and Ivan a tutorial in Cetagandan customs. The Star Crèche is the haut-lord gene bank; all haut conceptions including any genetic alterations are created therein. All activities of the Star Crèche are presently on hold until the dowager's successor is appointed by the emperor. The ghem-lords, who serve the haut, are themselves half-haut, descendants of Cetagandans of extraordinary merit and the haut wives with which the emperor occasionally rewards them. To his concealed horror, Miles learns that his rod is the Great Key of the Star Crèche, a major piece of Imperial regalia, which is supposed to be turned over to the dowager's successor at the end of the official period of mourning. After Maz departs, Miles promises the panicked Ivan that he will get rid of the incriminating rod very soon now. Both are afraid the Ba Lura cut its throat in shame for losing the Great Key, making its death their fault.

The next evening, Miles and Ivan attend a party at Lord Yenaro's run-down suburban mansion. Miles discovers that Yenaro is best known as a perfumer, not a sculptor. Miles meets a ghem-lady, who invites him for a walk in the garden—only to turn him over, at the back gate, to the hairless ba who had escorted him to the haut Rian at the Celestial Garden. The ba leads Miles to where the glowing white bubble again awaits.

Miles learns that the Ba Lura, before its death, told the haut Rian a

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false tale of being overpowered by six Barrayarans, and the Key deliberately stolen. Miles offers his own version of the encounter, and presses Rian to explain what the Ba was doing on an orbital transfer station with the Great Key in the first place. She claims the Ba was stealing it. But where was Lura taking the Key? Miles offers to return the Key to Rian face-to-face, forcing her to drop her bubble. A small triumph: he is going to see a haut woman, and Ivan isn't.

The haut Rian proves no old lady, but an ethereal woman of icon-like reserve, clothed in the white of mourning. The impact of her beauty knocks Miles to his knees, lost in ebony hair and ice-blue eyes. He lays the Great Key at her feet, thinking, I am Fortune's Fool.

The haut Rian attempts to open the Great Key with a code ring. Nothing happens. The Key is either broken, sabotaged, or a decoy, and Miles is the last person to have had it in his possession. Miles learns the Key is not merely ceremonial, but the sole decoder for the haut race's central gene bank. There is no back-up. Miles demands an explanation of why the Ba Lura ever removed it from the Celestial Garden.

Haltingly, Rian reveals a plot by the late empress. Lisbet had long felt the haut race was too centralized and genetically narrow, and wished dispersal of copies of the gene bank to each of the Cetagandan Empire's eight planetary satrapies, a move her son the emperor opposed for security reasons. So she'd had copies made in secret, and charged the Ba Lura and Rian to deliver them to each of the satrap governors on the occasion of her funeral, which they would all be sure to attend. This, Rian informs Miles, has already been accomplished. But Empress Lisbet died earlier than she'd expected to, before she had arranged copies of the Great Key. Ba Lura, against Rian's judgment, wished to take the Key to one of the governors for duplication, and apparently was trying to do so when it ran afoul of the Barrayarans. The political side-effects of this mitosis of the gene bank could include the break-up of the Cetagandan Empire into civil war and eight new expanding centers, a nightmare concept for Cetaganda's neighbors such as Barrayar. And . . . Rian does not know which *satrap governor the Ba Lura was trying to contact.*

Miles begins to suspect the Ba Lura in fact succeeded, and hit the Barrayarans not on the way to *its meeting with the satrap governor, but on the way* back. *The Barrayarans will be accused of the substitution, leaving the satrap governor to sneak home with the only copy of the real Great Key. The Ba was murdered by the unknown satrap governor to eliminate the only witness to the truth. Rian is doubtful, but promises to do what investigating she can inside the Celestial Garden.*

Miles returns to Yenaro's party, where Ivan reappears in a state of well-suppressed rage, claiming in an undervoice that he thinks he's been poisoned. The two cousins hurriedly depart. In the embassy ground-car, Ivan confides that he was taken up-

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stairs by two beautiful ghem-women, **Lady Arvin** *and* **Lady Benello,** *and seduced—up to a point, when it became apparent to him that sometime during the evening Yenaro had slipped him an anti-aphrodisiac. Ivan rose to the occasion in the only way he could, making up a lot of instant barbarian folklore about a Vor lord's self-control, and leaving his fascinated ghem-lady audience satisfied by other means. To Miles, it seems another elaborately humiliating trap like his encounter with the sculpture that fried his legs.*

The next morning the dapper and decorous ghem-Colonel **Benin** *of the Celestial Garden's own security arrives at the embassy. He has been assigned to investigate the supposed suicide of the Ba Lura. Miles quickly realizes that the subtle Benin is also thinking of murder, and that his investigation, if successful, must lead eventually back to the same satrap governor Miles is so anxious to identify and thwart. Miles is strategically vague about his conversation with the haut Rian, but posits the haut ladies' bubbles as a method of transport for a murderer and his victim. Benin is already aware of the possibility, and because of the high security of the bubbles, its implication—that someone over Benin's head in his own Security may have a hand in the murder, making any other verdict than confirming the suicide very dangerous to Benin's career. Miles also draws Benin's attention to the Ba Lura's movements in the days before its death, hoping thus to help target the satrap governor. Miles then suggests Benin make personal contact with the Cetagandan emperor, to request protection for his investigation against any attempt to quash it. Miles and Benin part warily pleased with each other. Ivan is cheered to receive a flood of social invitations from his new ghem-lady friends.*

Miles returns to the Celestial Garden to attend the readings of elegiac poetry for the dead empress, in order to get a personal look at his eight satrap-governor suspects. The governors are trailed by eight white bubbles that, Maz informs Miles, contain their Consorts—not wives, but women independently appointed by the Empress to oversee the Star Crèche's business on each of the satrapies. Miles realizes his eight suspects have just become sixteen. Miles also gets his first look at the emperor, the haut **Fletchir Giaja**.

At a reception following the poetry readings, Miles tries to stir up some response by mentioning Yenaro to three of his top suspects, governors the haut **Este Rond,** *one of Barrayar's neighbors, the haut* **Ilsum Kety** *of distant Sigma Ceta, and the haut Prince* **Slyke Giaja,** *half-brother of the emperor. He also meets the beautiful haut* **Vio,** *wife of Kety's ghem-General* **Chilian,** *who by her marriage has lost the haut-lady privilege of the force bubble.*

His investigations are interrupted by the arrival of Rian's little ba servitor, who delivers Miles to the Star Crèche itself, a surprisingly utilitarian building in the heart of the Celes-

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tial Garden. Inside, Rian tells him she has been paid a visit by Prince Slyke, ostensibly for a tour, actually to request a view of the Empress's Regalia, including the false Key. Miles suggests a covert visit to Slyke's state ship, in orbit, to search for the real Key.

Miles emerges from the Star Crèche to find the dryly frustrated ghem-Colonel Benin, excluded from monitoring inside the Star Crèche, waiting. Benin escorts the Barrayarans rather firmly to the exit; fortunately, this is no place for two Security officers from rival empires to sit down and compare notes.

The next day, Miles and Ivan attend a ghem-ladies' genetic engineering exhibition, where Miles has arranged to meet Rian's contact. Instead, they run into Lord Yenaro again, who claims to be helping Lady Benello's sister with her entry, a cloth laced with scent glands that emit subtle perfumes. As Yenaro invites the Barrayarans for a closer look, Miles realizes the ghem-lordling is about to inadvertently set off a chemical bomb that would blow out half the building, an event Miles barely manages to prevent. After a demonstration convinces the disbelieving Yenaro that he too was to be a victim, Yenaro confesses that he was receiving assistance and direction in his increasingly lethal practical jokes from governor the haut Illsum Kety. Miles cancels the planned raid on Slyke Giaja's ship in favor of this new target.

The next day Miles is called on the carpet before Colonel **Vorreedi**, *head of the Barrayaran Embassy's security, who is growing suspicious of the young envoy's strange activities. Without admitting anything, Miles manages to convince Vorreedi that he is on a covert ops mission from their mutual ImpSec superior Chief Simon Illyan; partly true, Miles is indeed a covert ops agent, but has no orders for this mess, which he has found all on his own. In the meantime, ghem-Colonel Benin has requested a second interview, and Miles must face both colonels simultaneously.*

Benin has traced the Ba Lura's movements to Miles's docking bay; this time Miles supplies almost the true story of their meeting, leaving out only mention of the Great Key. Miles turns over the ba's nerve disruptor as corroborative evidence. Benin departs, clearly unsatisfied. In Ivan's room, yet more social invitations have arrived from assorted ghem-ladies, one of which Miles identifies as the occasion for his next contact with Rian. Ivan offhandedly suggests they foil the unknown satrap governor by having Rian recall all the gene banks, thus leaving the would-be traitor with a key but no lock, short-cutting the whole problem. The breathtaking simplicity of the plan quite bowls Miles over.

At an evening garden party on a penthouse rooftop overlooking the Celestial Garden itself, Miles is picked up by the haut **Pel Navarr**, *Consort of Eta Ceta, who confirms some of his theories about haut-lady bubbles by smuggling him into the Celestial Garden while riding in hers. They*

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arrive at an extraordinary council meeting in the Star Crèche of Rian and all eight Consorts, including Kety's own Consort, the aged haut **Nadina**. *Rian requires Miles to testify about the recent events. Though the Council of Consorts had previously agreed to help carry out their late Empress's secret plan, the present crisis has convinced them they must wait for some better-controlled opportunity. Miles urges them to retrieve the gene banks. The haut Pel returns Miles to the penthouse party in her bubble.*

Conclusion

CHAPTER THIRTEEN

There was nothing he would have liked more than a day off, Miles reflected, but not *today*. The worst was the knowledge that he'd done this to himself. Until the consorts completed their retrieval of the gene banks, all he could do was wait. And unless Rian sent a car to the embassy to pick him up, a move so overt as to be vigorously resisted by both sets of Imperial Security, it was impossible for Miles to make contact with her again until the Gate-song Ceremonies tomorrow morning at the Celestial Garden. He grumbled under his breath, and called up more data on his suite's comconsole, then stared at it unseeing.

He wasn't sure it was wise to give Lord X an extra day either, for all that this afternoon would contain a nasty shock for him when his consort came to take away his gene bank. That would eliminate his last chance of sitting tight, and gliding away with bank and Key, perhaps dumping his old centrally-appointed and controlled consort out an airlock en route. The man must realize now that Rian would turn him in, even if it meant incriminating herself, before letting him get away. Assassinating the Handmaiden of the Star Crèche hadn't been part of the Original Plan, Miles was fairly sure. Rian had been intended to be a blind puppet, accusing Miles and Barrayar of stealing her Key. Lord X had a weakness for blind puppets. But Rian was loyal to the haut, beyond her own self-interest. No right-minded plotter could assume she would stay paralyzed for long.

Lord X was a tyrant, not a revolutionary. He wanted to take over the system, not change it. The late empress was the real revolutionary, with her attempt to divide the haut into eight competing sibling branches, and may the best superman win. The Ba Lura might have been closer to its mistress's mind than Rian allowed. *You can't give power away and keep it simultaneously*. Except posthumously.

So what would Lord X do now? What *could* he do now, but fight to the last, trying anything he could think of to avoid being brought down for this? It was that or slit his wrists, and Miles didn't think he was the wrist-slitting type. He would still be searching for some way to pin it all on Barrayar, preferably in the form of a dead Miles who couldn't give him the lie. There was even still a faint chance he could bring that off, given the Cetagandan lack of enthusiasm of outlanders in general and Barrayarans in particular. Yes, this was a good day to stay indoors.

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So would the results have been any better if Miles had publicly turned over the decoy Key and the truth on the very first day? No . . . then the embassy and its envoys would be mired right now in false accusations and public scandal, and no way to prove their innocence. If Lord X had picked any other delegation but Barrayar's upon which to plant his false Key—say, the Marilacans, the Aslunders, or the Vervani—his plan might yet be running along like clockwork. Miles hoped sourly that Lord X was Very, Very Sorry that he'd targeted Barrayar. *And I'm going to make you even sorrier, you sod.*

Miles's lips thinned as he turned his attention back to his comconsole. The satrap governors' ships were all to the same general plan, and a general plan, alas, was all the Barrayaran embassy data bank had available without tapping in to the secret files. Miles shuffled the holovid display though the various levels and sections of the ship. *If I were a satrap governor planning revolt, where would I hide the Great Key? Under my pillow?* Probably not.

The governor had the Key, but not the Key's key, so to speak; Rian still possessed that ring. If Lord X could open the Great Key, he could do a data dump, possess himself of a duplicate of the information-contents, and maybe, in a pinch, return the original, divesting himself of material evidence of his treasonous plans. Or even destroy it, hah. But if the Key were easy to get open, he should have done this already, when his plans first began to go seriously wrong. So if he was still trying to access the Key, it ought to be located in some sort of cipher lab. So where on this vast ship was a suitable cipher lab. . . ?

The chime of his door interrupted Miles's harried perusal. Colonel Vorreedi's voice inquired, "Lord Vorkosigan? May I come in?"

Miles sighed. "Enter." He'd been afraid all this comconsole activity would attract Vorreedi's attention. The protocol officer had to be monitoring from downstairs.

Vorreedi trod in, and studied the holovid display over Miles's shoulder. "Interesting. What is it?"

"Just brushing up on Cetagandan warship specs. Continuing education, officer-style, and all that. The hope for promotion to ship duty never dies."

"Hm." Vorreedi straightened. "I thought you might like to hear the latest on your Lord Yenaro."

"I don't think I own him, but—nothing fatal, I hope," said Miles sincerely. Yenaro might be an important witness, later; upon mature reflection Miles was beginning to regret not offering him asylum at the embassy.

"Not yet. But an order has been issued for his arrest."

"By Cetagandan Security? For treason?"

"No. By the civil police. For theft."

"It's a false charge, I'd lay odds. Somebody's trying to use the system to smoke him out of hiding. Can you find out who laid the charge?"

"A ghem-lord by the name of Nevic. Does that mean anything to you?"

"No. He's got to be a puppet. The man who put Nevic up to it is the man we want. The same man who

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supplied Yenaro with the plans and money for his fun-fountain. But now you have two strings to pull."

"You imagine it to be the same man?"

"Imagination," said Miles, "has nothing to do with it. But I need proof, stand-up-in-court type proof."

Vorreedi's gaze was uncomfortably level. "Why did you guess the charge against Yenaro would be treason?"

"Oh, well . . . I wasn't thinking. Theft is much better, less flashy, if what his enemy wants is for the civil police to drag Yenaro out into the open where he can get a clear shot at him."

Vorreedi's brows crimped. "Lord Vorkosigan. . . ." But he appeared to think better of whatever he'd been about to say. He just shook his head and departed.

Ivan wandered in later, flung himself onto Miles's sofa, put up his booted feet on the armrest, and sighed.

"You still here?" Miles shut down his comconsole, which was by now making him cross-eyed. "I thought you'd be out making hay, or rolling in it, or whatever. Our last two days here and all. Or did you run out of invitations?" Miles jerked his thumb ceilingward, *We may be bugged.*

Ivan's lip curled, *Screw it.* "Vorreedi has laid on more bodyguards. It kind of takes the spontaneity out of things." He stared into the air. "Besides, I worry about where I put my feet, now. Wasn't it some queen of Egypt who was delivered in a rolled-up carpet? Could happen again."

"Could indeed," Miles had to agree. "Almost certainly will, in fact."

"Great. Remind me not to stand next to you."

Miles grimaced.

After a minute or two Ivan added, "I'm bored."

Miles chased him from his room.

The ceremony of Singing Open The Great Gates did not entail the opening of any gates, though it did involve singing. A massed chorus of several hundred ghem, both male and female, robed in white-on-white, arranged themselves near the eastern entrance inside the Celestial Garden. They planned to pass in procession around the four cardinal directions and eventually, later in the afternoon, finish at the north gate. The chorus stood to sing along an undulating area of ground with surprising acoustic properties, and the galactic envoys and ghem and haut mourners stood to listen. Miles flexed his legs, inside his boots, and prepared to endure. The open venue left lots of space for haut-lady bubbles, and they were out in force—some hundreds, scattered about the glade. How many haut-women *did* live here?

Miles glanced around his little delegation—himself, Ivan, Vorob'yev and Vorreedi all in House blacks, Mia Maz dressed as before, striking in black and white. Vorreedi looked more Barrayaran, more officer-like, and, Miles had to admit, a lot more sinister out of his deliberately dull Cetagandan civvies. Maz rested one hand on Vorob'yev's arm and stood on tiptoe as the music started.

Breathtaking, Miles realized, could

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be a quite literal term—his lips parted and the hairs on the backs of his arms stood on end as the incredible sounds washed over him. Harmonies and dissonances followed one another up and down the scale with such precision, the listener could make out every word, when the voices were not simply wordless vibrations that seemed to crawl right up the spine, and ring in the back-brain in a succession of pure emotions. Even Ivan stood transfixed. Miles wanted to comment, to express his astonishment, but breaking into the absolute concentration the music demanded seemed some sort of sacrilege. After about a thirty-minute performance, the music came to a temporary close, and the chorus prepared to move gracefully off to its next station, followed more clumsily by the delegates.

The two groups took different routes. Ba servitors under the direction of a dignified ghem-lord major domo shepherded the delegates to a buffet, to both refresh and delay them while the chorus set up for its next performance at the southern gate. Miles stared anxiously after the haut-lady bubbles, which naturally did not accompany the outlander envoys, but floated off in their own mob in yet a third direction. He was getting less distracted by the diversions of the Celestial Garden. Could one finally grow to take it entirely for granted? The haut certainly seemed to.

"I think I'm getting used to this place," he confided to Ivan, as he walked along between him and Vorob'yev in the ragged parade of outlander guests. "Or . . . I could."

"Mm," said Ambassador Vorob'yev. "But when these pretty folks turned their pet ghem-lords loose to pick up some cheap new real estate out past Komarr, five million of *us* died. I hope that hasn't slipped your mind, my lord."

"No," said Miles tightly. "Not ever. But . . . even you are not old enough to remember the war personally, sir. I'm really starting to wonder if we'll ever see an effort like that from the Cetagandan Empire again."

"Optimist," murmured Ivan.

"Let me qualify that. My mother always says, behavior that is rewarded is repeated. And the reverse. I think . . . that if the ghem-lords fail to score any new territorial successes in our generation, it's going to be a long time till we see them try again. An expansionist period followed by an isolationist one isn't a new historical phenomenon, after all."

"Didn't know you'd taken up political science," said Ivan.

"Can you prove your point?" asked Vorob'yev. "In less than a generation?"

Miles shrugged. "Don't know. It's one of those subliminal gut-feel things. If you gave me a year and a department, I could probably produce a reasoned analysis, with graphs."

"I admit," said Ivan, "it's hard to imagine, say, Lord Yenaro conquering anybody."

"It's not that he couldn't. It's just that by the time he ever got a chance, he'd be too old to care. I don't know. After the next isolationist period, though, all bets are off. When the haut are done with ten more generations of tinkering with themselves, I

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don't know what they'll be." *And neither do they. That* was an odd realization. *You mean no one is in charge here?* "Universal conquest may seem like a crude dull game from their childhood after that. Or else," he added glumly, "they'll be unstoppable."

"Jolly thought," grumbled Ivan.

A delicate breakfast offering was set up in a nearby pavilion. On the other side of it, the float-cars with the white silk upholstery waited to convey refreshed funeral envoys the couple of kilometers across the Celestial Garden to the south gate. Miles nabbed a hot drink, refused with concealed loathing the offer of a pastry tray—his stomach was knotting with nervous anticipation—and watched the movements of the ba servitors with hawk-like attention. *It has to break today. There's no more time. Come on, Rian!* And how the devil was he to take Rian's next report when he had Vorreedi glued to his hip? The man was noting his every eye-flicker, Miles swore.

The day wore on with a repeat of the cycle of music and food and transportation. A number of the delegates were looking glassily overloaded with it all; even Ivan had stopped eating in self-defense at about stop three. When the contact did come, at the buffet after the fourth and last choral performance, Miles almost missed it. He was making idle chit-chat with Vorreedi, reminiscing about Keroslav District baking styles, and wondering how he was going to distract and ditch the man. Miles had reached the point of desperation of fantasizing slipping Ambassador Vorob'yev an emetic and sic'ing, so to speak, the protocol officer on his superior while Miles ducked out, when he saw out of the corner of his eye Ivan talking with a grave ba servitor. He did not recognize this ba; it was not Rian's favorite little creature, for it was young and had a brush of blond hair. Ivan's hands turned palm-out, and he shrugged, then he followed the servitor from the pavilion, looking puzzled. *Ivan? What the hell does she want Ivan for?*

"Excuse me, sir," Miles cut across Vorreedi's words, and around his side. By the time Vorreedi had turned after him, Miles had darted past another delegation and was halfway to the exit after Ivan. Vorreedi would follow, but Miles would just have to deal with that later.

Miles emerged, blinking, into the artificial afternoon light of the dome just in time to see the dark shadow and boot gleam of Ivan's uniform disappear around some flowering shrubbery, beyond an open space featuring a fountain. He trotted after, his own boots scuffing unevenly on the colored stone walks threading the greenery. "Lord Vorkosigan?" Vorreedi called after him. Miles didn't turn around, but raised his hand in an acknowledging, but still rapidly receding, wave. Vorreedi was too polite to curse out loud, but Miles could fill in the blank.

The man-high shrubbery, broken up by artistic groupings of trees, wasn't quite a maze, but nearly so. Miles's first choice of directions opened onto some sort of unpeopled water mead-

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ow, with the stream generated from the nearby fountain running like silver embroidery through its center. He ran back along his route, cursing his legs and his limp, and swung around the other end of the bushes.

In the center of a tree-shaded circle lined with benches, a haut-chair floated with its high back to Miles, its screen down. The blond servitor was gone already. Ivan leaned in toward the float-chair's occupant, his lips parted in fascination, his brows drawn down in suspicion. A white-robed arm lifted. A faint cloud of iridescent mist puffed into Ivan's surprised face. Ivan's eyes rolled back, and he collapsed forward across the seated occupant's knees. The force screen snapped up, white and blank. Miles yelled and ran toward it.

The haut-ladies' float-chairs were hardly race cars, but they could move faster than Miles could run. In two turns through the shrubbery it was out of sight. When Miles cleared the last stand of flowers, he found himself facing one of the major carved-white-jade-paved walkways that curved through the Celestial Garden. Floating along it in both directions were half a dozen haut-bubbles, all now moving at the same dignified walking pace. Miles had no breath left to swear, but black thoughts boiled off his brain.

He spun on his heel, and ran straight into Colonel Vorreedi.

Vorreedi's hand descended on his shoulder and took a good solid grip on the uniform cloth. "Vorkosigan, what the hell is going on? And where is Vorpatril?"

"I'm . . . just about to go check on that right now, sir, if you'll permit me."

"Cetagandan Security had better know. I'll light up their lives if they've—"

"I . . . don't think Security can help us on this one, sir. I think I need to talk to a ba servitor. Immediately."

Vorreedi frowned, trying to process this. It obviously did not compute. Miles couldn't blame him. Until a week ago, he too had shared the universal assumption that Cetagandan Imperial Security was in charge here. *And so they are, in some ways. But not all ways.*

Speak of the devil. As Miles and Vorreedi turned to retrace their steps to the pavilion, a red-uniformed, zebra-faced guard appeared, striding rapidly toward them. Sheepdog, Miles judged, sent to round up straying galactic envoys. Fast, but not fast enough.

"My lords," the guard, a low-ranker, nodded very politely. "The pavilion is this way, if you please. The float cars will take you to the South Gate."

Vorreedi appeared to come to a quick decision. "Thank you. But we seem to have mislaid a member of our party. Would you please find Lord Vorpatril for me?"

"Certainly." The guard touched a wrist com and reported the request in neutral tones, while still firmly herding Miles and Vorreedi pavilion-ward. Taking Ivan, for now, as merely a lost guest; that had to happen fairly often, since the garden was designed to entice the viewer on into its delights. *I give Cetagandan Security maybe ten minutes to figure out he's really disappeared, in the middle of the Celes-*

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tial Garden. Then it all starts coming apart.

The guard split off as they climbed the steps to the pavilion. Back inside, Miles approached the oldest bald servitor he saw. "Excuse me, Ba," he said respectfully. The ba glanced up, nonplused at not being invisible. "I must communicate immediately with the haut Rian Degtiar. It's an emergency." He opened his hands and stood back.

The ba appeared to digest this for a moment, then gave a half bow and motioned Miles to follow. Vorreedi came too. Around a corner in the semi-privacy of a service area, the ba pulled back its gray and white uniform sleeve and spoke into its wrist-comm, a quick gabble of words and code phrases. Its non-existent eyebrows rose in surprise at the return message. It took off its wrist-com, handed it to Miles with a low bow, and retreated out of earshot. Miles wished Vorreedi, looming over his shoulder, would do the same, but he didn't.

"Lord Vorkosigan?" came Rian's voice from the comm—unfiltered, she must be speaking from inside her bubble.

"Milady. Did you just send one of your . . . people, to pick up my cousin Ivan?"

There was a short pause. "No."

"I witnessed this."

"Oh." Another, much longer pause. When her voice came back again, it had gone low and dangerous. "I know what is happening."

"I'm glad somebody does."

"I will send *my* servitor for you."

"And Ivan?"

"*We* will handle that." The comm cut abruptly. Miles almost shook it in frustration, but handed it back to the servitor instead, who took it, bowed again, and scooted away.

"Just what did you witness, Lord Vorkosigan?" Vorreedi demanded.

"Ivan . . . left with a lady."

"What, *again?* Here? *Now?* Does the boy have no sense of time or place? This isn't Emperor Gregor's birthday party, dammit."

"I believe I can retrieve him very discreetly, sir, if you will allow me." Miles felt a faint twinge of guilt for slandering Ivan by implication, but the twinge was lost in his general, heart-hammering fear. Had that aerosol been a knockout drug, or a lethal poison?

Vorreedi took a long, long minute to think this one over, his eye cold on Miles. Vorreedi, Miles reminded himself, was Intelligence, not Counter-intelligence; *curiosity, not paranoia,* was his driving force. Miles shoved his hands into his trouser pockets and tried to look calm, unworried, merely annoyed. As the silence lengthened, he dared to add, "If you trust nothing else, sir, please trust my competence. That's all I ask."

"Discreet, eh?" said Vorreedi. "You've made some interesting friends here, Lord Vorkosigan. I'd like to hear a lot more about them."

"Soon, I hope, sir."

"Mm . . . very well. But be prompt."

"I'll do my best, sir," Miles lied. It had to be today. Once away from his guardian, he wasn't coming back till the job was done. *Or we are all un-*

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done. He gave a semi-salute, and slipped away before Vorreedi could think better of it.

He went to the open side of the pavilion and stepped down into the artificial sunlight just as a float-car arrived that was not funereally decorated: a simple two-passenger cart with room for cargo behind. A familiar aged little bald ba was at the controls. The ba spotted Miles, swung closer, and brought its vehicle to a halt. They were intercepted by a quick-moving red-clad guard.

"Sir. Galactic guests may not wander the Celestial Garden unaccompanied."

Miles opened his palm at the ba servitor.

"My Lady requests and requires this man's attendance. I must take him," said the ba.

The guard looked unhappy, but gave a short, reluctant nod. "My superior will speak to yours."

"I'm sure." The ba's lips twitched in what Miles swore was a smirk.

The guard grimaced, and stepped away, his hand reaching for his comm link. *Go, go!* thought Miles as he climbed aboard, but they were already moving. This time, the float-car took a short cut, rising up over the garden and heading southwest in a straight line. They actually moved fast enough for the breeze to ruffle Miles's hair. In a few minutes, they descended toward the Star Crèche, gleaming pale through the trees.

A strange procession of white bubbles was bobbling toward what was obviously a delivery entrance at the back of the building. Five bubbles, one on each side and one above, were . . . *herding* a sixth, bumping it along toward the high, wide door and into whatever loading bay lay beyond. The bubbles buzzed like angry wasps whenever their force-fields touched. The ba brought its little float-car calmly down into the tail of this parade, and followed the bubbles inside. The door slid closed behind them and sealed with that solid clunk and cacophony of chirps that bespoke high security.

Except for being lined with colored polished stone in geometric inlays instead of gray concrete, the loading bay was utilitarian and normal in design. It was presently empty except for the haut Rian Degtiar, standing in full flowing white robes beside her own float-chair, waiting. Her pale face was tense.

The five herding bubbles settled to the floor and snapped off, revealing five of the consorts Miles had met in the council night before last. The sixth bubble remained stubbornly up, white and solid and impenetrable.

Miles swung out of his cart as it settled to the pavement, and limped hurriedly to Rian's side. "Is Ivan in there?" he demanded, pointing at the sixth bubble.

"We think so."

"What's happening?"

"Sh. Wait." She made a graceful, palm-down gesture; Miles gritted his teeth, jittering inside. Rian stepped forward, her chin rising.

"Surrender and cooperate," said Rian clearly to the bubble, "and mercy is possible. Defy us, and it is not."

The bubble remained defiantly up

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and blank. Stand-off. The bubble had nowhere to go, and could not attack. *But she has Ivan in there.*

"Very well," sighed Rian. She pulled a pen-like object from her sleeve, with a screaming-bird pattern engraved in red upon its side, adjusted some control, pointed it at the bubble, and pressed. The bubbled winked out, and the float chair fell to the floor with a reverberant thump, all power dead. A yelp floated from a cloud of white fabric and brown hair.

"I didn't know anyone could do that," whispered Miles.

"Only the Celestial Lady has the override," said Rian. She put the control back in her sleeve, and stepped forward again, and stopped.

The haut Vio d'Chilian had recovered her balance instantly. She now half-knelt, one arm under Ivan's black-uniformed arm, supporting his slumping form, the other hand holding a thin knife to his throat. It looked very sharp, as it pressed against his skin. Ivan's eyes were open, dilated, shifting; he was paralyzed, not unconscious, then. *And not dead. Thank God.*

Yet.

The haut Vio d'Chilian, unless Miles missed his guess, would have no inhibitions whatsoever about cutting a helpless man's throat. He wished ghem-Colonel Benin were here to witness this.

"Move against me," said the haut Vio, "and your Barrayaran *servitor* dies." Miles supposed the emphasis was intended as a hautish insult. He was not quite sure it succeeded.

Miles paced anxiously to Rian's other side, making an arc around the haut Vio but venturing no closer. The haut Vio followed him with venomous eyes. Now directly behind her, the haut Pel gave Miles a nod; her float chair rose silently into the air and slipped out a doorway to the Crèche. Going for help? For a weapon? Pel was the practical one . . . he had to buy time.

"Ivan!" Miles said indignantly. "*Ivan's* not the man you want!"

The haut Vio's brows drew down. "What?"

But of course. Lord X always used front men, and women, for his leg-work, keeping his own hands clean. Miles had been galloping around doing the leg-work; therefore, Lord X must have reasoned that Ivan was really in charge. "Agh!" Miles cried. "What did you think? That because he's taller, and, and cuter, he had to be running this show? It's the haut way, isn't it? You—you *morons! I'm* the brains of this outfit!" He paced the other way, spluttering. "I had you spotted from Day One, don't you know? But no! Nobody ever takes me seriously!" Ivan's eyes, the only part of him that apparently still worked, widened at this rant. "So you went and kidnapped the *wrong man*. You just blew your cover for the sake of grabbing the *expendable* one!" The haut Pel hadn't gone for help, he decided. She'd gone to the lav to fix her hair, and was going to take *forever* in there.

Well, he certainly had the undivided attention of everyone in the loading bay—murderess, victim, hautcops and all. What next, handsprings? "It's been like this since we were little

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kids, y'know? Whenever the two of us were together, they'd always talk to *him* first, like I was some kind of idiot alien who needed an interpreter—" the haut Pel reappeared silently in the doorway, lifted her hand—Miles's voice rose to a shout, "Well, I'm sick of it, d'you hear?!"

The haut Vio's head twisted in realization just as the haut Pel's stunner buzzed. Vio's hand spasmed on the knife as the stunner beam struck her. Miles pelted forward as a line of red appeared at the blade's edge, and he grabbed for Ivan as she slumped unconscious. The stun nimbus had caught Ivan too, and his eyes rolled back. Miles let the haut Vio hit the floor on her own, as hard as gravity took her. Ivan, he lowered gently.

It was only a surface cut. Miles breathed again. He pulled out his pocket handkerchief and dabbed at the sticky trickle of blood, then pressed it against the wound.

He glanced up at the haut Rian, and the haut Pel, who floated over to examine her handiwork. "She knocked him over with some kind of drug-mist. Stun on top of that—is he in medical danger?"

"I think not," said Pel. She dismounted from her float chair, knelt, and rummaged through the unconscious haut Vio's sleeves, and came up with an assortment of objects, which she laid out in a methodical row on the pavement. One was a tiny silvery pointed thing with a bulb on the end. The haut Pel waved it under her lovely nose, sniffing. "Ah. This is it. No, he's in no danger. It will wear off harmlessly. He'll be very sick when he wakes up, though."

"Maybe you could give him a dose of synergine?" Miles pleaded.

"We have that available."

"Good." He studied the haut Rian. *Only the Celestial Lady has the override*. But Rian had used it as one entitled, and no one had blinked, not even the haut Vio. *Have you grasped this yet, boy? Rian is the acting Empress of Cetaganda, until tomorrow, and every move she's made has been with full, real, Imperial authority. Handmaiden, ha.* Another one of those impenetrable, misleading haut titles that didn't say what it meant; you had to be in the know.

Assured of Ivan's eventual recovery, Miles scrambled to his feet and demanded, "What's happening now? How did you find Ivan? Did you get all the gene banks back, or not? What did you—"

The haut Rian held up a restraining hand, to stem the flood of questions. She nodded to the dead bubble-chair. "This is the Consort of Sigma Ceta's float-chair, but as you see, the haut Nadina is not with it."

"Ilsum Kety! Yes? What *happened?* How'd he diddle the bubble? How'd you detect it? How long have you known?"

"Ilsum Kety, yes. We began to know last night, when the haut Nadina failed to return with her gene bank. All the others were back and safe by midnight. But Kety apparently only knew that his consort would be missed at this morning's ceremonies. So he sent the haut Vio to impersonate her. We suspected at once, and watched her."

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"Why *Ivan?*"

"That, I do not know yet. Kety *cannot* make a consort disappear without great repercussions; I suspect he meant to use your cousin to divest himself of guilt somehow."

"Another frame, yes, that would fit his *modus operandi*. You realize, the haut Vio . . . must have murdered the Ba Lura. At Kety's direction."

"Yes." Rian's eyes, falling on the prostrate form of the brown-haired woman, were very cold. "She, too, is a traitor to the haut. That will make her the business of the Star Crèche's own justice."

Miles said uneasily, "She could be an important witness, to clear Barrayar and me of blame in the disappearance of the Great Key. Don't, um . . . do anything premature, till we know if that's needed, huh?"

"Oh, we have *many* questions for her, first."

"So . . . Kety still has his bank. And the Key. And a warning." *Damn*. Whose idiot idea had it been. . . ? Oh. Yes. *But you can't blame Ivan for this one. You thought recalling the gene banks was a great move. And Rian bought it too. Idiocy by committee, the finest kind.*

"And he has his consort, whom he knows he cannot let live. Assuming she still lives now. I did not think . . . I would be sending the haut Nadina to her death." The haut Rian stared at the far wall, avoiding both Miles's and Pel's eyes.

Neither did I. Miles swallowed sickness. "He can bury her in the chaos of his revolt, once it gets going. But he can't start his revolt yet." He paused. "But if, in order to arrange her death in some artistic way that incriminates Barrayar, he needs Ivan . . . I don't think she'll be dead yet. Saved, held prisoner on his ship, yes. Not dead yet." *Please, not dead yet.* "We know one other thing, too. The haut Nadina is successfully concealing information from him, or even actively misleading him. Or he wouldn't have tried what he just tried." Actually, that could also be construed as convincing evidence that the haut Nadina *was* dead. Miles bit his lip. "But now Kety's made enough overt moves to incriminate himself, for charges to stick to him and not to me, yes?"

Rian hesitated. "Maybe. He is clearly very clever."

Miles stared at the inert float chair, sitting slightly canted, and looking quite ordinary without its magical electronic nimbus. "So are we. Those float-chairs. Somebody here must security-key them to their operators in the first place, right? Would I be making too silly a wild-ass guess if I suggested that person was the Celestial Lady?"

"That is correct, Lord Vorkosigan."

"So you have the override, and could encode this to anybody."

"Not to anybody. Only to any haut-woman."

"Ilsum Kety is expecting the return of this haut-bubble, after the ceremonies, with a haut-woman and a Barrayaran prisoner, yes?" He took a deep breath. "I think . . . we should not disappoint him."

CHAPTER FOURTEEN

"I found Ivan, sir." Miles smiled into

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the comconsole. The background beyond Ambassador Vorob'yev's head was blurred, but the sounds of the buffet winding down—subdued voices, the clink of plates—carried clearly over the comm. "He's getting a tour of the Star Crèche. We'll be here a while yet—can't insult our hostess and all that. But I should be able to extract him and catch up with you before the party's over. One of the ba will bring us back."

Vorob'yev looked anything but happy at this news. "Well. I suppose it will have to do. But Colonel Vorreedi does not care for these spontaneous additions to the planned itinerary, regardless of the cultural opportunity, and I must say I'm beginning to agree with him. Don't, ah . . . don't let Lord Vorpatril do anything inappropriate, eh? The haut are not the ghem, you know."

"Yes, sir. Ivan's doing just fine. Never better." Ivan was still out cold, back in the freight bay, but the returning color to his face had suggested the synergine was starting to work.

"Just how did he obtain this extraordinary privilege, anyway?" asked Vorob'yev.

"Oh, well, you know Ivan. Couldn't let me score a coup he couldn't match. I'll explain it all later. Must go now."

"I'll be fascinated to hear it," the ambassador murmured dryly. Miles cut the comm before his smile fractured and fell off his face.

"*Whew*. That buys us a little time. A very little time. We need to move."

"Yes," agreed his escort, the brown-haired Rho Cetan lady. She turned her float chair and led him out of the side-office containing the comconsole; he had to trot to keep up.

They returned to the freight bay just as Rian and the haut Pel finished recoding the haut Nadina's bubble-chair. Miles spared an anxious glance for Ivan, laid out on the tessellated pavement. He seemed to be breathing deeply and normally.

"I'm ready," Miles reported to Rian. "My people won't come looking for us for at least an hour. If Ivan wakes up . . . well, *you* should have no trouble keeping him under control." He licked lips gone dry. "If things go wrong . . . go to ghem-Colonel Benin. Or to your emperor himself. No Imperial Security middlemen. Everything about this, especially the ways Governor Kety has been able to diddle what everyone fondly believed were diddle-proof systems, is screaming to me that he's suborned a connection high up, probably very high up, in your own security who's giving him serious aid and comfort. Being rescued by him could be a fatal experience, I suspect."

"I understand," said Rian gravely. "And I agree with your analysis. The Ba Lura would not have taken the Great Key to Kety for duplication in the first place if it had not been convinced that he was capable of carrying out the task." She straightened from the float-chair arm, and nodded to the haut Pel.

The haut Pel had filled her sleeves with most of the little items she had taken from the haut Vio. She nodded back, straightened her robes, and gracefully settled herself aboard. The little items did not, alas, include ener-

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gy weapons, the power packs of which would set off security scanners. *Not even a stunner,* Miles thought with morbid regret. *I'm going into orbital battle wearing dress blacks and riding boots, and I'm totally disarmed. Wonderful.* He took his place again at Pel's left side, perched on the cushioned armrest, trying not to feel like the ventriloquist's dummy that he glumly fancied he resembled. The bubble's force screen enclosed them, and Rian stood back, and nodded. Pel, her right hand on the control panel, spun the bubble, and they floated quickly toward the exit, which dilated to let them pass; two other consorts exited simultaneously, and sped off in other directions.

Miles felt a brief pang in his heart that Pel and not Rian was his companion in arms. In his heart, but not in his head. It was essential not to place Rian, the most creditable witness of Kety's treason, in Kety's power. And . . . he liked Pel's style. She had already demonstrated her ability to think fast and clearly in an emergency. He still wasn't sure that drop over the side of the building night before last hadn't been for her amusement, rather than for secrecy. A haut-woman with a sense of humor, almost . . . too bad she was eighty years old, and a consort, and Cetagandan, and. . . . *Give it up, will you? Ivan you aren't nor ever will be. But one way or another, Governor the haut Ilsum Kety's treason is not going to last the day.*

They joined Kety's party as it was making ready to depart at the south gate of the Celestial Garden. The haut Vio would have been sent to collect Ivan at the last possible moment, to be sure. Kety's train was large, as befit his governor's dignity: a couple of dozen ghem-guards, plus ghem-ladies, non-ba servitors in his personal livery, and rather to Miles's dismay, ghem-General Chilian. *Was* Chilian in on his master's treason, or was he due to be dumped along with the haut Nadina on the way home, and replaced with Kety's own appointee? He had to be one or the other; the commander of Imperial troops on Sigma Ceta could hardly be expected to stay neutral in the upcoming coup.

Kety himself gestured the haut Vio's bubble into his own vehicle for the short ride to the Imperial shuttleport, the exclusive venue for all such high official arrivals to and departures from the Celestial Garden. Ghem-General Chilian took another car; Miles and the haut Pel found themselves alone with Kety in a van-like space clearly designed for the lady-bubbles.

"You're late. Complications?" Kety inquired cryptically, settling back in his seat. He looked worried and stern, as befit an earnest mourner—or a man riding a particularly hungry and unreliable tiger.

Yeah, and I should have known he was Lord X when I first spotted that fake gray hair, Miles decided. This was one haut-lord who didn't want to wait for what life might bring him.

"Nothing I couldn't handle," reported Pel. The voice-filter, set to maximum blur, altered her tones into a fair imitation of the haut Vio's.

"I'm sure, my love. Keep your force screen up till we're aboard."

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"Yes."

Yep. Ghem-General Chilian definitely has an appointment with an unfriendly airlock, Miles decided. *Poor sucker.* The haut Vio, perhaps, meant to get back into the haut genome one way or another. So was she Kety's mistress, or his master? Or were they a team? Two brains rather than one behind this plot could account for its speed, flexibility, and confusion all together.

The haut Pel touched a control, and turned to Miles. "When we get aboard, we must decide whether to look first for the haut Nadina or the Great Key."

Miles nearly choked. "Er . . ." he gestured toward Kety, sitting less than a meter from his knee.

"He cannot hear us," Pel reassured him. It seemed to be so, for Kety turned abstracted eyes to the passing view outside the luxurious lift-van's polarized canopy.

"The recovery of the Key," Pel went on, "is of the highest priority."

"Mm. But the haut Nadina, if she's still alive, is an important witness, for Barrayar's sake. And . . . she may have an idea where the Key is being kept. I think it's in a cipher lab, but it's a damned big ship, and there's a lot of places Kety may have tucked a cipher lab."

"Both it and Nadina will be close to his quarters," Pel said.

"He won't have her in the brig?"

"I doubt . . . Kety will have wished many of his soldiers or servitors to know that he holds his consort prisoner. No. She will most likely be secreted in a cabin."

"I wonder where Kety figures to stage whatever fatal crime he's planned involving Ivan and the haut Nadina? The consorts move on pretty constricted paths. He won't site it on his own ship, nor his own residence. And he probably doesn't dare repeat the performance inside the Celestial Garden, that would be just *too* much. Something downside, I fancy, and tonight."

Governor Kety glanced at their force bubble, and inquired, "Is he waking up yet?"

Pel touched her lips, then her controls. "Not yet."

"I want to question him, before. I must know how much they know."

"Time enough."

"Barely."

Pel killed her outgoing sound again.

"The haut Nadina first," Miles voted firmly.

"I . . . think you're right, Lord Vorkosigan," sighed Pel.

Further dangerous conversation with Kety was blocked by the confusion of loading the shuttle to convey the portion of retinue that was going to orbit; Kety himself was busied on his comm link. They did not find themselves alone with the governor again until the whole mob had disgorged into the shuttle hatch corridor aboard Kety's state ship, and gone off about their various duties or pleasures. Ghem-General Chilian did not even attempt to speak with his wife. Pel followed at Kety's gesture. From the fact that Kety had dismissed his guards, Miles reasoned that they were about to get down to business. Limit-

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ing witnesses limited the murders necessary to silence them, later, if things went wrong.

Kety led them to a broad, tastefully appointed corridor obviously dedicated to upper-class residence suites. Miles almost tapped the haut Pel on the shoulder. "Look. Down the hall. Do you see?"

A liveried man stood guard outside one cabin door. He braced to attention at the sight of his master. But Kety turned in to another cabin first. The guard relaxed slightly.

Pel craned her neck. "Might it be the haut Nadina?"

"Yes. Well . . . maybe. I don't think he'd dare use a regular trooper for the duty. Not if he doesn't control their command structure yet." Miles felt a strong pang of regret that he hadn't figured out the schism between Kety and his ghem-general earlier. Talk about exploitable opportunities. . . .

The door slid closed behind them, and Miles's head snapped around to see what they were getting into now. The chamber was clean, bare of decoration or personal effects: an unused cabin, then.

"We can put him here," said Kety, nodding to a couch in the sitting-room portion of the chamber. "Can you keep him under control chemically, or must we have some guards?"

"Chemically," responded Pel, "but I need a few things. Synergine. Fast-penta. And we'd better check him for induced fast-penta allergies first. Many important people are given them, I understand. I don't think you want him to die *here*."

"Clarium?"

Pel glanced at Miles, her eyes widening in question; she did not know that one. Clarium was a fairly standard military interrogation tranquilizer—Miles nodded.

"That would be a good idea," Pel hazarded.

"No chance of his waking up before I get back, is there?" asked Kety in concern.

"I'm afraid I dosed him rather strongly."

"Hm. Please be more discreet, my love. We don't want excessive chemical residues left upon autopsy. Though with luck, there will not be enough left to autopsy."

"I'm reluctant to count on luck."

"*Good*," said Kety, with a peculiar exasperation. "You're learning at last."

"I'll await you," said Pel coolly, by way of a broad hint. As if the haut Vio would have done anything else.

"Let me help you lay him out," Kety said. "It must be crowded in there."

"Not for me. I'm using him for a footrest. The float chair is . . . most comfortable. Let me . . . enjoy the privilege of the haut a little longer, my love," Pel sighed. "It has been so long. . . ."

Kety's lips thinned in amusement. "Soon enough, you shall have more privileges than the empress ever had. And all the outworlders at your feet you may desire." He gave the bubble a short nod, and departed, striding quickly. Where would a haut-governor with an interrogation chemistry shopping list go? Sickbay? Security? And how long would it take?

"Now," said Miles. "Back up the corridor. We have to get rid of the

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guard—did you bring any of that stuff that the haut Vio used on Ivan?"

Pel pulled the tiny bulb from her sleeve and held it up.

"How many doses are left?"

Pel squinted. "Two. Vio over-prepared." She sounded faintly disapproving, as if Vio had lost style-points by this redundancy.

"I'd have taken a hundred, just in case. All right. Use it sparingly—not at all if you don't have to."

Pel floated her bubble out of the cabin again, and turned up the corridor. Miles slid around behind the float-chair, crouching with his hands gripping the high back and his boots slipping slightly on base which held the power pack. *Hiding behind a woman's skirts?* It was frustrating as hell to have his transportation—and everything else—under the control of a Cetagandan, even if the rescue mission *was* his idea. *But needs must drive.* Pel came to a halt before the liveried guard.

"Servitor," she addressed him.

"Haut," he nodded respectfully to the blank white bubble. "I am on duty, and may not assist you."

"This will not take long." Pel flicked off her force screen. Miles heard a faint hiss, and a choking noise. The float chair rocked. He popped up to find Pel with the guard slumped very awkwardly across her lap.

"Damn," said Miles regretfully, "we should have done this to Kety back in the first cabin—oh, well. Let me at that door pad."

It was a standard palm-lock, but set to whom? Very few, maybe Kety and Vio only, but the guard must be empowered to handle emergencies. "Move him up a little," Miles instructed Pel, and pressed the unconscious man's palm to the read-pad. "Ah," he breathed in satisfaction, as the door slid aside without alarm or protest. He relieved the guard of his stunner, and tiptoed inside, the haut Pel floating after.

"*Oh*," huffed Pel in outrage. They had found the haut Nadina.

The old woman was sitting on a couch similar to the one in the previous cabin, wearing only her white body-suit. The effects of a century or so of gravity were enough to sag even her haut body; taking away her voluminous outer wrappings seemed a deliberate indignity only barely short of stripping her naked. Her silver hair was clamped, half a meter from its end, in a device obviously borrowed from engineering and never designed for this purpose, but locked in turn to the floor. It was not physically cruel—the length of the rest of her hair still left her nearly two meters of turning room—but there was something deeply offensive about it. The haut Vio's idea, perhaps? Miles thought he knew how Ivan had felt, contemplating the kitten tree. It seemed a Wrong Thing to do to a little old lady (even one from a race as obnoxious as the haut) who reminded him of his Betan grandmother—well, not really, *Pel* actually seemed more like his Grandmother Naismith in personality, but—

Pel dumped the unconscious guard unceremoniously on the floor and rushed from her float chair to her sister consort. "Nadina, are you injured?"

"Pel!" Anyone else would have fall-

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en on her rescuer's neck in a hug; being haut, they confined themselves to a restrained, if apparently heartfelt, handclasp.

"Oh!" said Pel again, gazing furiously at the haut Nadina's situation. Her first action was to skin out of her own robes and donate about six under-layers to Nadina, who shrugged them on gratefully, and stood a little straighter. Miles completed a fast survey of the premises to be sure they were indeed alone, and returned to the women, who stood contemplating the hair-lock. Pel knelt and tugged at a few strands, which held fast.

"I've tried that," sighed the haut Nadina. "They won't come out even one hair at a time."

"Where is the key to its lock?"

"Vio had it."

Pel quickly emptied her sleeves of her mysterious arsenal; Nadina looked it over and shook her head.

"We'd better cut it," said Miles. "We have to go as quickly as possible."

Both women stared at him in shock. "Haut-women *never* cut their hair!" said Nadina.

"Um, excuse me, but this is an emergency. If we go at *once* to the ship's escape pods, I can pilot you both to safety before Kety awakes to his loss. Maybe even get away clean. Every second's delay costs us our very limited margin."

"No!" said Pel. "We must retrieve the Great Key first!"

He could not, unfortunately, send the two women off and promise to search for the Key on his own; he was the only qualified orbital pilot in the trio. They were going to have to stick together, blast it. One haut-lady was bad enough. Managing two was going to be worse than trying to herd cats. "Haut Nadina, do you know where Kety keeps the Great Key?"

"Yes. He took me to it last night. He thought I might be able to open it for him. He was very upset when I couldn't."

Miles glanced up sharply at her tone; there were no marks of violence on her face, at least. But her movements were stiff. Arthritis of age, or shock-stick trauma? He returned to the guard's unconscious body, and began searching it for useful items, code cards, weapons . . . ah. A folded vibra-knife. He palmed it, out of sight, and returned to the ladies.

"I've heard of animals gnawing their legs off, to escape traps," he offered cautiously.

"Ugh!" said Pel. "Barrayarans."

"You don't understand," said Nadina earnestly.

He was afraid he did. They would stand here arguing about Nadina's trapped haut-hair until Kety caught up with them. "Look!" he pointed at the door.

Pel jerked to her feet, and Nadina cried, "What?"

Miles snapped open the vibra-knife, grabbed the mass of silver hair, and sliced through it as close to the clamp as he could. "There. Let's *go*."

"Barbarian!" cried Nadina. But she wasn't going to go over the edge into hysterics; she shrieked her belated protest quite quietly, all things considered.

"A sacrifice for the good of the haut," Miles promised her. A tear

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stood in her eye; Pel . . . Pel looked as if she were secretly grateful the deed had been done by him and not her.

They all boarded the float-chair again, Nadina half across Pel's lap, Miles clinging on behind. Pel exited the chamber and raised her force screen. Float-chairs were supposed to be soundless, but the engine whined protest at this overload. It moved forward with a disconcerting lurch.

"Down this way. Turn right here," the haut Nadina directed. Halfway down the hall they passed an ordinary servitor, who stepped aside with a bow, and did not look back at them.

"Did Kety fast-penta you?" Miles asked Nadina. "How much does he know of what the Star Crèche suspects about him?"

"Fast-penta does not work on haut-women," Pel informed him over her shoulder.

"Oh? How about on haut-men?"

"Not *very* well," said Pel.

"Hm. Nevertheless."

"Down here," Nadina pointed to a lift tube. They descended a deck, and continued down another, narrower corridor. Nadina touched the silver hair piled in her lap, regarded the raggedly-cut end with a deep frown, then let the handful fall with an unhappy, but rather final-sounding, snort. "This is all highly improper. I trust you are enjoying your opportunity for sport, Pel. And that it will be brief."

Pel made a noncommittal noise.

Somehow, this was not the heroic covert ops mission that Miles had envisioned in his mind—blundering around Kety's ship in tow of a pair of prim, aging haut-ladies—well, Pel's allegiance to the proprieties was highly suspect, but Nadina appeared to be trying to make up for it. He had to admit, the bubble beat the hell out of his trying to disguise his physical peculiarities in the garb of a ba servitor, especially given that the ba appeared to be uniformly healthy and straight. Enough other haut women were aboard that the sight of a passing bubble was unremarkable to staff and crew.

No. We've just been lucky, so far.

They came to a blank door. "This is it," said Nadina.

No give-away guard this time; this was the little room that wasn't there. "How do we get in?" asked Miles. "Knock?"

"I suppose so," said Pel. She dropped her force screen just long enough to do so, then raised it again.

"I meant that as a *joke,*" said Miles, horrified. Surely no one was in there—he'd pictured the Great Key kept alone in some safe or coded compartment—

The door opened. A pale man with dark rings under his eyes, dressed in Kety's livery, pointed a device at the bubble, read off the electronic signature that resulted, and said "Yes, haut Vio?"

"I . . . have brought the haut Nadina to try again," said Pel. Nadina grimaced in disapproving editorial.

"I don't think we're going to need her," said the liveried man, "but you can talk to the General." He stood aside to let them pass within.

Miles, who had been calculating how to knock the man out with Pel's

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aerosol again, started his calculations over. There were three men in the—floating cipher lab, yes. An array of equipment, festooned with temporary cables, cluttered every available surface. An even more whey-faced tech wearing the black undress uniform of Cetagandan military security sat before a console with the air of a man who'd been there for days, as evidenced by the caffeinated drink containers littered around him in a ring, and a couple of bottles of commercial painkillers sitting atop a nearby counter. But it was the third man, leaning over his shoulder, who riveted Miles's attention.

It wasn't ghem-General Chilian, as his mind had first tried to assume. This officer was a younger man, taller, sharp-faced, who wore the blood-red dress uniform of the Celestial Garden's own Imperial Security. He was not wearing his proper zebra-striped face paint, though. His tunic was rumpled and hanging open. Not the chief of security—Miles's mind ratcheted down the list he had memorized, weeks ago, in mis-aimed preparation for this trip—ghem-General Naru, yes, that was the man, third in command in that very inner hierarchy. Kety's deduced seduced contact. Called in, apparently, to lend his expertise in cracking the codes that protected the Great Key.

"All right," said the whey-faced tech, "start over with branch 7,306. Only 700 more to go, and we'll have it, I swear."

Pel gasped, and pointed. Piled in a disorderly heap on the table beyond the console was not one but eight copies of the Great Key. Or one Great Key and seven copies. . . .

Could Kety be attempting to carry out the late Empress Lisbet's vision after all? Was all the chaos of the past two weeks some confused misunderstanding? No . . . no. This had to be some other scam. Maybe he planned to send his fellow governors home with bad copies, or give Cetagandan Imperial Security seven more decoys to chase, or . . . a multitude of possibilities, as long as they advanced Kety's own personal agenda and no one else's.

Firing his stunner would set off every alarm in the place, making it a weapon of last resort. Hell, his victims, if clever—and Miles suspected he faced three very clever men—might jump him just to make him fire it.

"What *else* do you have up your sleeve?" Miles whispered to Pel.

"Nadina," Pel gestured to the table, "which one is the Great Key?"

"I'm not sure," said Nadina, peering anxiously at the clutter.

"Grab them *all.* Check *later,*" urged Miles.

"But they could all be false," dithered Pel. "We must know, or it could all be for nothing." She fished in her bodice, and pulled out a familiar ring on a chain, with a raised screaming bird pattern. . . .

Miles choked. "For God's sake, you didn't bring that *here?* Keep it out of sight! After two weeks of trying to do what that ring does in a second, I guarantee those men wouldn't hesitate to kill you for it!"

Ghem-General Naru wheeled from

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his tech to face the pale glowing bubble. "Yes, Vio, what is it now?" His voice was bored, and dripping with open contempt.

Pel looked a little panicked; Miles could see her throat move, as she subvocalized some practice reply, then rejected it.

"We're not going to be able to keep this up for much longer," said Miles. "How about we attack, grab, and run?"

"How?" asked Nadina.

Pel held up her hand for silence from the on-board debating team, and essayed a temporizing reply to the general. "Your tone of voice is most improper, sir."

Naru grimaced. "Being back in your bubble makes you proud again, I see. Enjoy it while it lasts. We'll have all of those damned bitches pried out of their little fortresses after this. Their days of being cloaked by the Emperor's blindness and stupidity are numbered, I assure you, *haut* Vio."

Well . . . Naru wasn't in on this plot for the sake of the late empress's vision of genetic destiny, that was certain. Miles could see how the haut-women's traditional privacies could come to be a deep, itching offense, to a dedicated, properly-paranoid security man. Was that the bribe Kety had offered Naru for his cooperation, the promise that the new regime would open the closed doors of the Star Crèche, and shine light into every secret place held by the haut-women? That he would destroy the haut-women's strange and fragile power-base, and put it all into the hands of the ghem-generals, where it obviously (to Naru) belonged? So was Kety stringing Naru along, or were they near-equal co-plotters? Equals, Miles decided. *This is the most dangerous man in the room, maybe even on the ship.* He set the stunner for low beam, in a forlorn hope of not setting off alarms on discharge.

"Pel," Miles said urgently, "get ghem-General Naru with your last dose of sleepy-juice. I'll try to threaten the others, get the drop on them, without actually firing. Tie them up, grab the Keys, and get out of here. It may not be elegant, but it's fast, and we're *out of time*."

Pel nodded reluctantly, twitched her sleeves back, and readied the little aerosol bulb. Nadina gripped the chair-back: Miles prepared to spring away and take up a firing stance.

Pel dropped her bubble and squirted the aerosol toward Naru's startled face. Naru held his breath and ducked away, barely grazed by the iridescent cloud of drug. His breath puffed back out on a yell of warning.

Miles cursed, leapt, stumbled, and fired three times in rapid succession. He dropped the two scrambling techs; Naru nearly succeeded in rolling away again, but at last the beam nimbus brought the ghem-general to a twitching halt. Temporarily. Naru lumbered around on the deck like a warthog mired in a bog, his voice reduced to a garbled groan.

Nadina hurried to the table full of Keys, swept them into her outermost robe, and brought them back to Pel. Pel began trying the ring-key on each one. "Not that one . . . not that. . . ."

Miles glanced at the door, which re-

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mained closed, would remain closed until an authorized hand pressed its palm-lock. Who would be so authorized? Kety . . . Naru, who was already in here . . . any others? *We're about to find out.*

"Not . . ." Pel continued. "Oh, what if they're *all* false? No. . . ."

"Of course they are," Miles realized. "The real one must be, must be," he began tracing cables from the cipher tech's comconsole. They led to a box, stuffed in behind some other equipment, and in the box was—another Great Key. But this one was braced in a comm light-beam, carrying the signals that probed its codes. "—*here*." Miles yanked it from its place, and sprinted back to Pel. "We've got the Key, we've got Nadina, we've got the goods on Naru, we've got it all. Let's *go*."

The door hissed open. Miles whirled and fired.

A stunner-armed man in Kety's livery stumbled backward. Thumps and shouts echoed from the corridor, as what seemed a dozen more men stood quickly out of the line of fire. "*Yes,*" cried Pel happily, as the cap of the real Great Key came off in her hand, demonstrating its provenance.

"Not now!" screeched Miles. "Put it back, Pel, put your force screen up, *now!*"

Miles ducked aboard the floatchair; its force screen snapped into place. A blast of massed stunner fire roiled through the doorway. The stunner fire crackled harmlessly around the sparkling sphere, only making it glitter a bit more. But the haut Nadina had been left outside. She cried out and stumbled backward, painfully grazed by the stun-nimbus. Men charged through the door.

"You have the Key, Pel!" cried the haut Nadina. "Flee!"

An impractical suggestion, alas; as his men secured the room and the haut Nadina, Governor Kety strolled through the door and closed it behind him, palm-locking it.

"Well," he drawled, eyes alight with curiosity at the carnage before him. "Well." He might at least have had the courtesy to curse and stamp, Miles thought sourly. Instead he looked . . . quite thoroughly in control. "What have we here?"

A Kety-liveried trooper knelt by ghem-General Naru, and helped straighten him and hold him up by his shoulders. Naru, struggling to sit, rubbed a shaking hand over his doubtless numb and tingling face—Miles had experienced the full unpleasantness of being stunned himself, more than once in his past—and essayed a mumbling answer. On the second try he managed slurred but intelligible speech. " 'S the Consorts Pel and Nadina. An' the Barray'arn. *Tol* you those damned bubbles were a secur'ty menace!" He slumped back into the trooper's arms. " 'S all right, though. We have 'em all now."

"When that voyeur is tried for his treasons," said the haut Pel poisonously, "I shall ask the emperor to have his eyes put out, before he is executed."

Miles wondered anew at the sequence of events here last night; how *had* they extracted Nadina from her bubble? "I think you're getting a little ahead of us, milady," he sighed.

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Kety walked around the haut Pel's bubble, studying it. Cracking this egg was a pretty puzzle for him. Or was it? He'd done it once before.

Escape was impossible; the bubble's movements were physically blocked. Kety might besiege them, starve them out, if he didn't mind waiting—no. Kety couldn't wait. Miles grinned blackly, and said to Pel, "This float-chair has communication link capacity, doesn't it? I'm afraid it's time to call for help."

They had, by God, *almost* brought it off, almost made the entire affair disappear without a trace. But now that they'd identified and targeted Naru, the threat of secret aid for Kety from inside Cetagandan Imperial Security was neutralized. The Cetagandans should be able to unravel the rest of it for themselves. *If I can get the word out.*

Governor Kety motioned the two men holding the haut Nadina to drag her forward to what he apparently guessed was in front of the bubble, except that he was actually about forty degrees offsides. He relieved one guardsman of his vibra-knife, stepped behind Nadina, and lifted her thick silver hair. She squeaked in terror, but relaxed again when he only laid the knife very lightly against her throat.

"Drop your force screen, Pel, and surrender. Immediately. I don't think I need to go into crude, tedious threats, do I?"

"No," whispered Pel in agreement. That Kety would slit the haut Nadina's throat now, and arrange the body later, was unquestionable. He'd gone beyond the point of no return some time ago.

"Dammit," grated Miles in anguish. "Now *he's* got it all. Us, the Great Key. . . ." *The Great Key*. Chocked full it was . . . coded information. Information the value of which lay entirely in its secrecy and uniqueness. Everywhere else people waded through floods of information, information to their eyebrows, a clogging mass of data, signal and noise—all information was transmittable and reproducible. Left to itself, it multiplied like bacteria as long as there was money or power to be had in it, till it choked on its own reduplication and the boredom of its human receivers.

"The float chair, your comm link—it's all Star Crèche equipment. Can you download the Great Key from it?"

"Do *what?* Why . . ." said Pel, struggling with astonishment, "I suppose so, but the chair's comm link is not powerful enough to transmit all the way back to the Celestial Garden."

"Don't worry about that. Patch it through to the commercial navigation's emergency communication net. There'll be a booster right outside this ship on the orbital transfer station. I have the standard codes for it in my head, they're made simple on purpose. Maximum emergency overrides—the booster'll split the signal and dump it into the on-board computers of every ship, commercial or military, navigating right now through the Eta Ceta star system, and every station. Supposed to be a cry-for-help system for ships in deep trouble, you see. So Kety'll have the Great Key. So will a couple thousand other people, and where is his sly little plot then?

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We may not be able to win, but we can take his victory from him!"

The look on Pel's face, as she digested this outrageous suggestion, transformed from horror to a fey delight, but then to dismay. "That will take—many minutes. Kety will never let—no! I have the solution for that." Pel's eyes lit with understanding and rage. "What are those codes?"

Miles rattled them off; Pel's fingers flashed over her control panel. A dicey moment followed while Pel arranged the opened Great Key in the light beam reader. Kety cried from outside the bubble, "Now, Pel!" His hand tightened on the knife. Nadina closed her eyes and stood in dignified stillness.

Pel tapped the comm link start code, dropped the bubble's force screen, and sprang out of her seat, dragging Miles with her. "All right!" she cried, stepping away from the bubble. "We're out."

Kety's hand relaxed. The bubble's screen snapped back up. The force of it almost pushed Miles off his feet; he stumbled into the unwelcoming arms of the haut governor's guards.

"That," said Kety coldly, eyeing the bubble with the Great Key inside, "is annoying. But a temporary inconvenience. Take them." He jerked his head at his guards, and stepped away from Nadina. "You!" he said in surprise, finding Miles in their grip.

"Me." Miles's lips peeled back on a white flash of teeth that had nothing to do with a smile. "Me all along, in fact. From start to finish." *And you are finished. Of course, I may be too dead to enjoy the spectacle. . . .* Kety dared not let any of the three interlopers live. But it would take a little time yet to arrange their deaths with civilized artistry. How much time, how many chances to—

Kety caught himself just before his fist delivered a jaw-cracking blow to Miles's face. "No. You're the breakable one, isn't that right," he muttered half to himself. He stepped back, nodded to a guard. "A little shock stick on him. On them all."

The guard unclipped his standard military issue shock stick, glanced at the white-robed haut consorts, and hesitated. He shot a covertly beseeching look at Kety.

Miles could almost see Kety grind his teeth. "All right, just the Barrayaran!"

Looking very relieved, the guard swung his stick with a will and belted Miles three times, starting with his face and skittering down his body to belly and groin. The first touch made him yell, the second took his breath away, and the third dropped him to the floor, blazing agony radiating outward and drawing his arms and legs in. Calculation stopped, temporarily. Ghem-General Naru, just being helped to his feet, chuckled in a tone of one happy to see justice done.

"General," Kety nodded to Naru, then to the bubble, "how long to get that open?"

"Let me see." Naru knelt to the unconscious whey-faced tech, and relieved him of a small device, which he pointed at the bubble. "They've changed the codes. Half an hour, once you get my men woken up."

Kety grimaced. His wrist comm

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chimed. Kety's brows rose, and he spoke into it. "Yes, Captain?"

"Haut-governor," came the formal, uneasy voice of some subordinate. "We are experiencing a peculiar communication over emergency channels. An enormous data dump is being speed-loaded into our systems. Some kind of coded gibberish, but it has exceeded the memory capacity of the receiver and is spilling over into other systems like a virus. It's marked with an Imperial override. The initial signal appears to be originating from *our* ship. Is this . . . something you intend?"

Kety's brows drew down in puzzlement. Then his gaze rose to the white bubble, glowing in the center of the room. He swore, one sharp, heartfelt sibilant. "No. Ghem-General Naru! We have to get this force screen down *now!*"

Kety spared a venomous glare for Pel and Miles that promised infinite retribution later, then he and Naru fell to frantic consultation. Heavy doses of synergine from the guards' med-kit failed to return the techs to immediate consciousness, though they stirred and groaned in a promising fashion. Kety and Naru were left to do it themselves. Judging by the wicked light in Pel's eyes, as she and the haut Nadina clung together, they were going to be way too late. The pain of the shock-stick blows were fading to pins and needles, but Miles remained curled up on the floor, the better not to draw further such attentions to himself.

Kety and Naru were so absorbed in their task and their irate arguments over the swiftest way to proceed, only Miles noticed when a spot on the door began to glow. Despite his pain, he smiled. A beat later, the whole door burst inward in a spray of melted plastic and metal. Another beat, to wait out anyone's hair-trigger reflexes.

Ghem-Colonel Benin, impeccably turned out in his blood-red dress uniform and freshly applied face paint, stepped firmly across the threshold. He was unarmed, but the red-clad squad behind him carried an arsenal sufficient to destroy any impediment in their path up to the size of a pocket dreadnought. Kety and Naru froze in mid-lurch; Kety's liveried retainers suddenly seemed to think better of drawing weapons, opening their hands palm-outward and standing very still. Colonel Vorreedi, equally impeccable in his House blacks, if not quite so cool in expression, stepped in behind Benin. In the corridor beyond, Miles could just glimpse Ivan looming behind the armed men, and shifting anxiously from foot to foot.

"Good evening, haut Kety, ghem-General Naru." Benin bowed with exquisite courtesy. "By the personal order of Emperor Fletchir Giaja, it is my duty to arrest you both upon the serious charge of treason to the Empire. And," contemplating Naru especially, Benin's smile went razor-sharp, "complicity in the murder of the Imperial Servitor the Ba Lura."

CHAPTER FIFTEEN

From Miles's eye-level, the deck sprouted a forest of red boots, as Benin's squad clumped in to disarm and arrest Kety's retainers, and march

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them out with their hands atop their heads. Kety and Naru were taken along with them, sandwiched silently between some hard-eyed men who didn't look as though they were interested in listening to explanations.

At a growl from Kety, the procession paused in front of the entering Barrayarans. Miles heard Kety's voice, icy-cold: "Congratulations, Lord Vorpatril. I hope you may be fortunate enough to survive your victory."

"Huh?" said Ivan.

Oh, let him go. It would be too exhausting to try and sort out Kety about his confused inversion of Miles's little chain-of-command. Maybe Benin would have it straight. At a sharp word from their sergeant the security squad prodded their prisoners back into motion and clattered on down the corridor.

Four shiny black boots made their way through the mob and halted before Miles's nose. Speaking of explanations. . . . Miles twisted his head and looked up the odd foreshortened perspective at Colonel Vorreedi and Ivan. The deck was cool beneath his stinging cheek, and he didn't really want to move, even supposing he could.

Ivan bent over him, giving an upside-down view up his nostrils, and said in a strained tone, "Are you all right?"

"Sh-sh-shock stick. Nothing b-broken."

"Right," said Ivan, and hauled him to his feet by his collar. Miles hung a moment, shivering and twitching like a fish on a hook, till he found his unsteady balance. By necessity, he leaned on Ivan, who supported him with an uncommenting hand under his elbow.

Colonel Vorreedi looked him up and down. "I'll let the ambassador do the protesting about that." Vorreedi's distant expression suggested he thought privately that the fellow with the shock stick had stopped too soon. "Vorob'yev is going to need all the ammunition he can get. You have created the most extraordinary public incident of his career, I suspect."

"Oh, Colonel," sighed Miles. "I predict there's going to b-be nothing p-public 'bout *this* incident. Wait 'n see."

Ghem-Colonel Benin, across the room, was bowing and scraping to the hauts Pel and Nadina, and supplying them with float-chairs, albeit lacking force-screens, extra robes, and ghem-lady attendants. Arresting them in the style to which they were accustomed?

Miles glanced up at Vorreedi. "Has Ivan, um, *explained* everything, sir?"

"I trust so," said Vorreedi, in a voice drenched with menace.

Ivan nodded vigorously, but then hedged, "Um . . . all I could. Under the circumstances."

Meaning, lack of privacy from Cetagandan eavesdroppers, Miles presumed. *All, Ivan? Is my cover still intact?*

"I admit," Vorreedi went on, "I am still . . . assimilating it."

"What h-happened after I left the Star Crèche?" Miles asked Ivan.

"I woke up and you were *gone*. I think that was the worst moment of my life, knowing you'd gone haring

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off on some crazy self-appointed mission with no back-up."

"Oh, but *you* were my back-up, Ivan," Miles murmured, earning himself a glare. "And a good one too, as you have just demonstrated, yes?"

"Yeah, your favorite kind—unconscious on the floor where I couldn't inject any kind of sense into the proceedings. You took off to get yourself killed, or worse, and everybody would have blamed me. The last thing Aunt Cordelia said to me before we left was, 'And *try* to keep him out of trouble, Ivan.' "

Miles could hear Countess Vorkosigan's weary, exasperated cadences quite precisely in Ivan's parody.

"Anyway, as soon as I figured out what the hell was going on, I got away from the haut-ladies—"

"*How?*"

"God, Miles, they're just like my mother, only eight times over. Ugh! Anyway, the haut Rian insisted I go through ghem-Colonel Benin, which I was willing to do—*he* at least seemed like he had his head screwed on straight—"

Perhaps attracted by the sound of his name, Benin strolled over to listen in on this.

"—And God be praised he paid attention to me. Seemed to make more sense out of my gabble than I did at the time."

Benin nodded. "I was of course following the very unusual activities around the Star Crèche today—"

Around, not *in*. Quite.

"My own investigations had already led me to suspect something was going on involving one or more of the haut-governors, so I had orbital squads on alert."

"Squads, ha," said Ivan. "There's three Imperial battle cruisers surrounding this ship right now."

Benin smiled slightly, and shrugged.

"Ghem-General Chilian is a dupe, I believe," Miles put in. "Though you will p-probably wish to question him about the activities of his wife, the haut Vio."

"He has already been detained," Benin assured him.

Detained, not arrested, all right. Benin seemed exactly on track so far. But had he realized yet that all the governors had been involved? Or was Kety elected sole sacrifice? *A Cetagandan internal matter,* Miles reminded himself. It was not his job to straighten out the entire Cetagandan government, tempting as it would be to try. His duty was confined to extracting Barrayar from the morass. He smiled at the glowing white bubble still protecting the real Great Key. The hauts Nadina and Pel were consulting with some of Benin's men; it appeared that rather than attempting to get the force screen down here they were making arrangements to transport it and its precious contents whole and inviolate back to the Star Crèche.

Vorreedi gave Miles a grim look. "One thing that Lord Vorpatril has not yet explained to my satisfaction, Lieutenant Vorkosigan, is why you concealed the initial incident involving an object of such obvious importance—"

"Kety was trying to frame Barrayar, sir. Until I could achieve independent corroborative evidence that—"

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Vorreedi went on inexorably, "*From your own side.*"

"Ah." Miles briefly considered a relapse of shock-stick symptoms, rendering him unable to talk. No, alas. His own motives were obscure even to him, in retrospect. What *had* he started out wanting, before the twisting events had made sheer survival his paramount concern? Oh, yes, promotion. That was it.

Not this time, boy-o. Antique but evocative phrases like *damage control* and *spin doctoring* free-floated through his consciousness.

"In fact, sir, I did not at first recognize the Great Key for what it was. But once the haut Rian contacted me, events slid very rapidly from apparently-trivial to extremely delicate. By the time I realized the full depth and complexity of the haut-governor's plot, it was too late."

"Too late for what?" asked Vorreedi bluntly.

What with the shock-stick residue and all, Miles did not need to feign a sick smile. But it seemed Vorreedi had drifted back to the conviction that Miles was not working as a covert ops agent for Simon Illyan after all. *That's what you want everybody to think, remember?* Miles glanced aside at ghem-Colonel Benin, listening in fascination.

"You would have taken the investigation away from me, you know you would have, sir. Everyone in the wormhole nexus thinks I'm a cripple who's been given a cushy nepotistic sinecure as a courier. That I might be competent for more is something Lieutenant Lord Vorkosigan would never, in the ordinary course of events, ever be given a chance to publicly prove."

To the world at large, true. But Illyan knew all about the pivotal role Miles had played in the Hegen Hub, and elsewhere, as did Miles's father Prime Minister Count Vorkosigan, and Emperor Gregor, and everyone else whose opinion really counted, back on Barrayar. Even Ivan knew about that extraordinary covert ops coup. In fact, it seemed the only people who didn't know were . . . the enemy he'd beaten. The Cetagandans.

So did you do all this only to shine in the haut Rian's beautiful eyes? Or did you have a wider audience in view?

Ghem-Colonel Benin slowly deciphered this outpouring. "You wanted to be a hero?"

"So badly you didn't even care for which *side?*" Vorreedi added in some dismay.

"I *have* done the Cetagandan Empire a good turn, it's true." Miles essayed a shaky bow in Benin's direction. "But it was Barrayar I was thinking of. Governor Kety had some nasty plans for Barrayar. Those, at least, I've derailed."

"Oh, yeah?" said Ivan. "Where would they, and you, be right now if we hadn't shown up?"

"Oh," Miles smiled to himself, "I'd already won. Kety just didn't know it yet. The only thing still in doubt was my personal survival," he conceded.

"Why don't you sign up for Cetagandan Imperial Security, then, coz," suggested Ivan in exasperation. "Maybe ghem-Colonel Benin would

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promote you."

Ivan, damn him, knew Miles all too well. "Unlikely," Miles said bitterly. "I'm too short."

Ghem-Colonel Benin's eyebrow twitched.

"Actually," Miles pointed out, "if I was free-lancing for anyone, it was for the Star Crèche, not for the Empire. I have not served the Cetagandan Empire, so much as the haut. Ask *them*." He nodded toward Pel and Nadina, getting ready to exit the room with their ghem-lady escorts fussing over their comfort.

"Hm." Ghem-Colonel Benin seemed to deflate slightly.

Magic words, apparently. A haut-consort's skirts made a stronger fortification behind which to hide than Miles would have thought possible, a few weeks ago.

The haut Nadina's bubble was hoisted into the air by some men with hand-tractors, and maneuvered out of the room. Benin glanced after it, turned again to Miles, and opened his hand in front of his chest in a sketch of a bow. "In any case, Lieutenant Lord Vorkosigan, my Celestial master the Emperor haut Fletchir Giaja requests you attend upon him in my company. Now."

Miles could decipher an Imperial command when he heard one. He sighed, and bowed in return, in proper honor of Benin's august order. "Certainly. Ah. . . ." he glanced aside at Ivan and the suddenly-agitated Vorreedi. He wasn't exactly sure he wanted witnesses for this audience. He wasn't exactly sure he wanted to be alone, either.

"Your . . . friends may accompany you," Benin conceded. "With the understanding that they may not speak unless invited to do so."

Which inviting would be done, if at all, solely by Benin's Celestial Master. Vorreedi nodded in partial satisfaction. Ivan began to practice looking blank with all his might.

They all herded out, surrounded and escorted—but not arrested, of course, that would violate diplomatic protocol—by Benin's Imperial guards. Miles found himself, still supported by Ivan, waiting to exit the doorway beside the haut Nadina.

"Such a nice young man," Nadina commented in a well-modulated undertone to Miles, nodding at Benin, whom they could glimpse out in the corridor directing his troopers. "So neatly turned-out, and he understands the proprieties. We'll have to see what we can do for him, don't you agree, Pel?"

"Oh, quite," Pel said, and floated on through.

After a lengthy walk through the great State ship, Miles cycled through the airlock into the Cetagandan security shuttle in the company of Benin himself, who had not let him out of his sight. Benin looked cool and alert as ever, but there was an underlying . . . well, *smugness* leaking through his zebra-striped facade. It must have given Benin a moment of supreme Cetagandan satisfaction, arresting his commanding officer for treason. The one-up high point of his career. Miles would have bet Betan dollars to sand Naru was the man who'd assigned the dapper and decorous Benin to close the case on the Ba Lura's death in the

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first place, setting him up to fail.

Miles ventured, "By the way, if I didn't say it before, congratulations on cracking your very tricky murder case, General Benin."

Benin blinked. "Colonel Benin," he corrected.

"That's what you think." Miles floated forward, and helped himself to the most comfortable window seat he could find.

"I don't believe I've seen this audience chamber before," Colonel Vorreedi whispered to Miles, his gaze flicking around to take in their surroundings. "It's not one ever used for public or diplomatic ceremonies."

Unusually, they had come not to a pavilion, but to a closed, low-lying building in the northern quadrant of the Celestial Garden. The three Barrayarans had spent an hour in an antechamber, cooling their heels while their internal tension rose. They were attended by half a dozen polite, solicitous ghem-guards, who saw to their physical comforts while courteously denying every request for outside communication. Benin had gone off somewhere with the hauts Pel and Nadina. In view of their Cetagandan company, Miles had not so much reported to Vorreedi as exchanged a few guarded remarks.

The new room reminded Miles a bit of the Star Chamber—simple, undistracting, deliberately serene, sound-baffled and cool in shades of blue. Voices had a curious deadened quality that hinted that the entire chamber was enclosed in a cone-of-silence. Patterns on the floor betrayed a large concealed comconsole table and station-chairs that could be raised for conferences, but for now, the supplicants stood.

Another guest was waiting, and Miles raised his brows in surprise. Lord Yenaro stood next to a red-clad ghem-guard. Yenaro looked pale, with dark greenish circles under his eyes, as if he had not slept for about two days. His dark robes, the same clothes Miles had last seen him wearing at the bioestheties exhibition, were rumpled and bedraggled. Yenaro's eyes widened in turn at the sight of Miles and Ivan. He turned his head away and tried not to notice the Barrayarans. Miles waved cheerfully, dragging a reluctantly polite return nod from Yenaro, and starting a very pained crease between his eyebrows.

And here came something to keep Miles's mind off his own lingering shock-stick pains right now. Or rather, someone.

Ghem-Colonel Benin entered first, and dismissed the Barrayarans' guards. He was followed by the hauts Pel, Nadina, and Rian in their float chairs, shields down, who silently arranged themselves on one side of the room. Nadina had tucked the cut ends of her hair out of sight among her garments, the same robes Pel had shared and which Nadina had not stopped to change. They had all obviously been closeted for the past hour in a debriefing at the highest level, for last of all a familiar figure strode in, shedding more guards in the corridor outside.

Close-up, Emperor the haut Fletchir Giaja seemed even taller and leaner

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than when Miles had seen him at a distance at the elegy-reading ceremonies. And older, despite his dark hair. He was for the moment casually dressed, by Imperial standards, in a mere half a dozen layers of fine white robes over the usual masculine-loose but blinding-white body suit, befitting his status as chief mourner.

Emperors *per se* did not unnerve Miles, though Yenaro swayed on his feet as though he were about to faint, and even Benin moved with the most rigid formality. Emperor Gregor had been raised along with Miles practically as his foster-brother; somewhere in the back of Miles's mind the term *emperor* was coupled with such identifiers as *somebody to play hide and seek with.* In this context those hidden assumptions could be a psychosocial land mine. *Eight planets, and older than my father,* Miles reminded himself, trying to inculcate a proper deference to the illusion of power Imperial panoply sought to create. One chair at the head of the room rose from the floor to receive what Gregor would have sardonically dubbed The Imperial Ass. Miles bit his lip.

It was apparently going to be a most intimate audience, for Giaja beckoned Benin over and spoke to him in a low voice, and Benin subsequently dismissed even Yenaro's guard. That left the three Barrayarans, the two planetary consorts and Rian, Benin, the emperor, and Yenaro. Nine, a traditional quorum for judgment.

Still, it was better than facing Illyan. Maybe the haut Fletchir Giaja was not disposed to razor-edged sarcasms. But anyone related to all those haut-women had to be dangerously bright. Miles swallowed against a babbling burst of explanations. *Wait for your straight lines, boy.*

Rian looked pale and grave. No clue there, Rian always looked pale and grave. A last pang of desire banked itself to a tiny, furtive ember in Miles's heart, secret and encysted like a tumor. But he could still be afraid for her. His chest was cold with that dread.

"Lord Vorkosigan," Fletchir Giaja's exquisite baritone broke the waiting silence.

Miles suppressed a quick glance around—it wasn't like there were any other Lords Vorkosigan present, after all—stepped forward, and came to a precise parade rest. "Sir."

"I am still . . . unclear, just what *your* place was in these recent events. And how you came by it."

"My place was to have been a sacrificial animal, and it was chosen for me by Governor Kety, sir. But I didn't play the part he tried to assign to me."

The emperor frowned at this less-than-straightforward reply. "Explain yourself."

Miles glanced at Rian. "Everything?"

She gave an almost imperceptible nod.

Miles closed his eyes in a brief, diffuse prayer to whatever sportive gods were listening, opened them again, and launched once more into the true description of his first encounter with the Ba Lura in the personnel pod, Great Key and all. At least it had the advantage of simultaneously getting in

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Miles's overdue confession to Vorreedi in a venue where the Embassy's chief security officer was totally blocked from making any comment or reply. Amazing man, Vorreedi, he betrayed no emotion beyond one muscle jumping in his jaw.

"As soon as I saw the Ba Lura in the funeral rotunda with its throat cut," Miles went on, "I realized my then-unknown opponent had thrown me into the logically impossible position of having to prove a negative. There was no way, once I had been tricked into laying hands on the false key, to prove that Barrayar had not effected a substitution, except by the positive testimony of the one eyewitness then lying dead on the floor. Or by positively locating the real Great Key. Which I set out to do. And if the Ba Lura's death was not a suicide, but rather a murder elaborately set up to pass as a suicide, it was clear someone high in the Celestial Garden's security was cooperating with the Ba's killers, which made approaching Cetagandan Security for help quite dangerous at that point. But then somebody assigned ghem-Colonel Benin to the case, presumably with heavy hints that it would be well for his career to bring in a quick verdict confirming suicide. Somebody who seriously underestimated Benin's abilities," *and ambition,* "as a security officer. *Was* it ghem-General Naru, by the way?"

Benin nodded, a faint gleam in his eye.

"For . . . whatever reason, Naru decided ghem-Colonel Benin would make a suitable additional goat. It was beginning to be a pattern in their operations, as you must realize if you've collected testimony from Lord Yenaro here—?" Miles raised an inquiring eyebrow at Benin. "I see you found Lord Yenaro before Kety's agents did. I think I'm glad, in all."

"You should be," Benin returned blandly. "We picked him up—along with his very interesting carpet—last night. His account was critical in shaping my response to your cousin's, um, sudden onslaught of information and demands."

"I see." Miles shifted his weight, his parade rest growing rather bent. He rubbed his face, because it didn't seem like the time or place to rub his crotch.

"Does your medical condition require you to sit?" Benin inquired solicitously.

"I'll manage." Miles took a breath. "I tried, in our first interview, to direct ghem-Colonel Benin's attentions to the subtleties of his situation. Fortunately, ghem-Colonel Benin is a subtle man, and his loyalty to you," *or to the truth,* "outweighed whatever implied threats to his career Naru presented."

Benin and Miles exchanged guarded, appreciative nods.

"Kety tried to deliver me into the hands of the Star Crèche, accused by means of Ba Lura's false confession to the Handmaiden," Miles continued carefully. "But once again his pawns ad libbed against his script. I entirely commend the haut Rian for her cool and collected response to this emergency. The fact that she kept her head and did not panic allowed me to continue to try to clear Barrayar of blame. She is, um, a credit to the haut, you

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know." Miles regarded her anxiously for a cue. *Where are we?* But she remained as glassily attentive as if that now-absent force bubble had become one with her skin. "The haut Rian acted throughout for the good of the haut, never once for her own personal aggrandizement or safety." Though one might argue, apparently, over where *the good of the haut* actually lay. "Your late August Mother chose her Handmaiden well, I'd say."

"That is hardly for you to judge, Barrayaran," drawled the haut Fletchir Giaja, whether in amusement, or dangerously, Miles's ear could not quite tell.

"Excuse me, but I didn't exactly volunteer for this mission. I was suckered into it. My *judgments* have brought us all here, one way or another."

Giaja looked faintly surprised, even a little nonplused, as if he'd never before had one of his gentle hints thrown back in his face. Benin stiffened, and Vorreedi winced. Ivan suppressed a grin, the merest twitch, and continued his Invisible Man routine.

The emperor took another tack. "And how did you come to be involved with Lord Yenaro?"

"Um . . . from my point of view, you mean?" Presumably Benin had already presented him with Yenaro's own testimony; a cross-check was in order, to be sure. In carefully neutral phrasing, Miles described his and Ivan's three encounters with Yenaro's increasingly lethal practical jokes, with a lot of emphasis on Miles's clever (once proved) theories about Lord X. Vorreedi's face drained to an interesting greenish cast upon Miles's description of the go-round with the carpet. Miles added cautiously, "In my opinion, certainly proved by the incident with the asterzine bomb, Lord Yenaro was as much an intended victim as Ivan and myself. There is no treason in the man." Miles cut off a slice of smile. "He hasn't the nerve for it."

Yenaro twitched, but did not gainsay any of it. Yeah, slather on the suggestion of Imperial mercy due all 'round, maybe some would slop over on the one who needed it most.

At Benin's direction, Yenaro, in a colorless voice, confirmed Miles's account. Benin called in a guard and had the ghem lord taken out, leaving eight in this chamber of Imperial inquisition. Would they work their way down to one?

Giaja sat silent for a time, then spoke, in formally modulated cadences. "That suffices for my appraisal of the concerns of the Empire. We must now turn to the concerns of haut. Haut Rian, you may keep your Barrayaran creature. Ghem-Colonel Benin, will you kindly wait in the antechamber with Colonel Vorreedi and Lord Vorpatril until I call you."

"Sire." Benin saluted his way out, shepherding the reluctant Barrayarans.

Obscurely alarmed, Miles put in, "But don't you want Ivan too, Celestial Lord? He witnessed almost everything with me."

"No," stated Giaja flatly.

That settled that. Well . . . until Miles and Ivan were out of the Celestial Garden, indeed, out of the Empire and halfway home, they wouldn't be

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any safer anyway. Miles subsided with a faint sigh; then his eyes widened at the abrupt change in the room's atmosphere.

Feminine gazes, formerly suitably downcast, rose in direct stares. Without awaiting permission, the three float chairs arranged themselves in a circle around Fletchir Giaja, who himself sat back with a face suddenly more expressive—dryer, edgier, angrier. The glassy reserve of the haut vanished in a new intensity. Miles swayed on his feet.

Pel glanced aside at the motion. "Give him a chair, Fletchir," she said. "Kety's guard shock-sticked him in the best regulation form, you know."

In her place, yes.

"As you wish, Pel." The emperor touched a control in his chair-arm; a station chair near Miles's feet rose from the floor. He fell more than sat in it, grateful and dizzy, on the edge of their circle.

"I hope you all see now," said the haut Fletchir Giaja more forcefully, "the wisdom of our ancestors in arranging that the haut and the Empire shall have only one interface. Me. Only one veto. Mine. Issues of the haut genome *must* remain as insulated as possible from the political sphere, lest they fall into the hands of politicians who do not understand the goal of haut. That includes most of our gentle ghem-lords, as ghem-General Naru has perhaps proved to you, Nadina." A flash of subtle, savage irony there—Miles suddenly doubted his initial perception of gender issues on Eta Ceta. What if Fletchir Giaja was haut first, and male second, and the consorts too were haut first, female second. . . . Who was in charge here, when Fletchir Giaja knew himself as a product of his mother's high art?

"Indeed," said Nadina, with a grimace.

Rian sighed wearily. "What can you expect from a half-breed like Naru? But it is the haut Ilsum Kety who has shaken my confidence in the Celestial Lady's vision. She often said that genetic engineering could only sow, that winnowing and reaping must still be done in an arena of competition. But Kety was not ghem, but *haut*. The fact that he could try what he tried . . . makes me think we have more work to do before the winnowing and reaping part."

"Lisbet always did have an addiction for the most primitive metaphors," Nadina recalled with faint distaste.

"She was right about the diversity issue, though," Pel said.

"In principle," Giaja conceded. "But this generation is not the time. The haut population can expand many times over into space presently held by servitor classes, without need for further territorial aggrandizement. The Empire is enjoying a necessary period of assimilation."

"The Constellations have been deliberately limiting their numerical expansion of late decades, to conserve their favored economic positions," observed Nadina disapprovingly.

"You know, Fletchir," Pel put in, "an alternate solution might be to require more constellation crosses by Imperial edict. A kind of genetic self-taxation. Novel, but Nadina is right. The

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Constellations have grown more miserly and luxurious with each passing decade."

"I thought the whole point of genetic engineering was to avoid the random waste of natural evolution, and replace it with the efficiency of reason," Miles piped up. All three haut women turned to stare at him in astonishment, as if a potted plant had suddenly offered a critique of its fertilization routine. "Or . . . so it seems to me," Miles trailed off in a much smaller voice.

Fletchir Giaga smiled, faint, shrewd, and wintry. Belatedly, Miles began to wonder why he was being kept here, by Giaja's suggestion/command. He had a most unpleasant sensation of being in a conversation with an undertow of cross-currents which were streaming in three different directions at once. *If Giaja wants to send a message, I wish he'd use a comconsole.* Miles's whole body was throbbing in time with the pulsing of his headache, several hours past midnight of one of the longer days of his short life.

"I will return to the Council of Consorts with your veto," said Rian slowly, "as I must. But Fletchir, you must address the diversity issue more directly. If this generation is not the time, it is still certainly not too soon to begin planning. And the diversification issue. The single-copy method of security is too horrifyingly risky, as recent events also prove."

"Hm," Fletchir Giaja half-conceded. His eye fell sharply upon Miles. "Nevertheless—Pel—whatever possessed you to spill the contents of the Great Key across the entire Eta Ceta system? As a joke, it does not amuse."

Pel bit her lip; her eyes, uncharacteristically, lowered.

Miles said sturdily, "No joke, sir. As far as we knew, we were both going to die within a few minutes. The haut Rian stated that the highest priority was the recovery of the Great Key. The receivers got the Key but no lock; without the gene banks themselves it was valueless gibberish from their point of view. One way or another, we assured you would be able to recover it, in pieces maybe, even after our deaths, regardless of what Kety did subsequently."

"The Barrayaran speaks the truth," affirmed Pel.

"The best strategies run on rails like that," Miles pointed out. "Live or die, you make your goal." He shut up, as Fletchir Giaja's stare hinted that perhaps outlander barbarians had better not make comments that could be construed as a slur on his late mother's abilities, even when those abilities had been pitted against him.

You can't get anywhere with these people, or whatever they are. I want to go home, Miles thought tiredly. "What will happen to ghem-General Naru, anyway?"

"He will be executed," said the emperor. To his credit, the bald statement clearly brought him no joy. "Security *must* be . . . secured."

Miles couldn't argue with that. "And the haut Kety? Will he be executed, too?"

"He will retire, immediately, to a supervised estate, due to ill health. If he objects, he will be offered suicide."

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"Er . . . forcibly, if necessary?"

"Kety is young. He will choose life, and other days and chances."

"The other governors?"

Giaja frowned annoyance at the consorts. "A little pragmatic blindness in that direction will close matters. But they will not find new appointments easy to come by."

"And," Miles glanced at the ladies, "the haut Vio? What about her? The others only tried to commit a crime. She actually succeeded."

Rian nodded. Her voice went very flat. "She, too, will be offered a choice. To replace the servitor she destroyed—de-sexed, depilated, and demoted to ba, her metabolism altered, her body thickened . . . but returned to a life inside the Celestial Garden, as she desired with a passion beyond reason. Or she may be permitted a painless suicide."

"Which . . . will she choose?"

"Suicide, I hope," said Nadina sincerely.

A multiple standard seemed at work in all this justice. Now that the thrill of the chase was over, Miles felt a nauseated revulsion at the shambles of the kill. *For this I laid my life on the line?*

"What about . . . the haut Rian? And me?"

Fletchir Giaja's eyes were cool and distant, light-years gone. "That . . . is a problem upon which I shall now retire and meditate."

The emperor called Benin back in to escort Miles away, after a short murmured conference. But away to where? Home to the embassy, or head-first down the nearest oubliette? Did the Celestial Garden have oubliettes?

Home, it appeared, for Benin returned Miles to the company of Vorreedi and Ivan, and took them to the Western Gate, where a car from the Barrayaran embassy already waited. They paused, and the ghem-Colonel addressed Vorreedi.

"We cannot control what goes into your official reports. But my Celestial Master . . ." Benin paused to select a suitably delicate term, "*expects* that none of what you have seen or heard will appear as social gossip."

"That, I think I can promise," said Vorreedi sincerely.

Benin nodded satisfaction. "May I have your words upon your names in the matter, please."

He'd been doing his homework upon Barrayaran customs, it seemed. The three Barrayarans dutifully gave their personal oaths, and Benin released them into the dank night air. It was about two hours till dawn, Miles guessed.

The embassy aircar was blessedly shadowed. Miles settled into a corner, wishing he had Ivan's talent for invisibility, but wishing most of all that they could cut tomorrow's ceremonies and start home immediately. No. He'd come this far, might as well see it through to the bitter end.

Vorreedi had gone beyond emotion to silence. He spoke to Miles only once, in chill tones.

"What *did* you think you were doing, Vorkosigan?"

"I stopped the Cetagandan Empire from breaking up into eight aggres-

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sively expanding units. I derailed plans for a war by some of them with Barrayar. I survived an assassination attempt, and helped catch three high-ranking traitors. Admittedly, they weren't *our* traitors, but still. Oh. And I solved a murder. That's enough for one trip, I hope."

Vorreedi struggled with himself for a moment, then bit out helplessly, "*Are* you a special agent, or not?"

On a need-to-know list . . . Vorreedi didn't. Not really, not at this point. Miles sighed inwardly. "Well, if not . . . I *succeeded* like one, didn't I?"

Ivan winced. Vorreedi sat back with no further comment, but radiating exasperation. Miles smiled grimly, in the dark.

CHAPTER SIXTEEN

Miles woke from a late, uneasy doze to find Ivan cautiously shaking him by the shoulder.

He closed his eyes again, blocking out the dimness of his suite and his cousin. "Go *'way*." He tried to pull the covers back up over his head.

Ivan renewed his efforts, more vigorously. "Now I know it was a mission," he commented. "You're having your usual post-mission sulks."

"I am not *sulking*. I am *tired*."

"You look terrific, you know. Great blotch on the side of your face that goon left with his shock-stick. Goes all the way up to your eye. It'll show from a hundred meters. You should get up and look in the mirror."

"I hate people who are cheerful in the morning. What time is it? Why are you up? Why are you *here?*" Miles lost his clutch on his bedclothes as Ivan dragged them ruthlessly from his grip.

"Ghem-Colonel Benin is on his way here to pick you up. In an Imperial land-cruiser half a block long. The Cetagandans want you at the cremation ceremony an hour early."

"What? *Why?* He can't be arresting me from here, diplomatic immunity. Assassination? Execution? Isn't it a little late for that?"

"Ambassador Vorob'yev also wants to know. He sent me to rustle you up as swiftly as possible." Ivan propelled Miles toward his bathroom. "Start depilating, I've brought your uniform and boots from the embassy laundry. Anyway, if the Cetagandans really wanted to assassinate you, they'd hardly do it here. They'd slip something subtle under your skin that wouldn't go off for six months, and then would drop you mysteriously and untraceably in your tracks."

"Reassuring thought." Miles rubbed the back of his neck, surreptitiously feeling for lumps. "I bet the Star Crèche has some great terminal diseases. But I pray I didn't offend *them*."

Miles suffered Ivan to play valet, on fast-forward, with editorials. But he forgave his cousin all sins, past, present, and future, in exchange for the coffee bulb Ivan also shoved into his hand. He swallowed and stared at his face in the mirror, above his unfastened black tunic. The shock-stick contusion across his left cheek was indeed turning a spectacular polychrome, crowned by a blue-black circle under his eye. The other two hits were not as bad, as his clothing had offered some protection. He still would have preferred to spend the

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day in bed. In his cabin on the outbound ImpSec jump ship, heading home as fast as the laws of physics would allow.

They arrived at the embassy's lobby to find not Benin but Mia Maz waiting in her formal black-and-white funeral clothing. She had been keeping Ambassador Vorob'yev company when they'd dragged in last night—this morning, rather—and could not have had much more sleep than Miles. But she looked remarkably fresh, even chipper. She smiled at Miles and Ivan. Ivan smiled back.

Miles squinted. "Vorob'yev not here?"

"He's coming down as soon as he's finished dressing," Maz assured him.

"You . . . coming with me?" Miles asked hopefully. "Or . . . no, I suppose you have to be with your own delegation. This being the big finish and all."

"I'll be accompanying Ambassador Vorob'yev." Maz's smile escaped into a chipmunk grin, dimples everywhere. "Permanently. He asked me to marry him last night. I think it was a measure of his general distraction. In the spirit of the insanity of the moment, I said yes."

If you can't hire help. . . . Well, that would solve Vorob'yev's quest for female expertise on the embassy's staff. Not to mention accounting for all that bombardment of chocolates and invitations. "Congratulations," Miles managed. Though perhaps it ought to be *Congratulations* to Vorob'yev and *Good luck* to Maz.

"It still feels quite strange," Maz confided. "I mean, *Lady Vorob'yev*. How did your mother cope, Lord Vorkosigan?"

"You mean, being an egalitarian Betan and all? No problem. She says egalitarians adjust to aristocracies just fine, as long as they get to be the aristocrats."

"I hope to meet her someday."

"You'll get along famously," Miles predicted with confidence.

Vorob'yev appeared, still fastening his black tunic, at almost the same moment as ghem-Colonel Benin was escorted inside by the embassy guards. Correction. Ghem-General Benin. Miles smiled under his breath at the glitter of new rank insignia on Benin's blood-red dress uniform. *I called that one right, did I not?*

"May I ask what this is all about, ghem-General?" Vorob'yev didn't miss the new order.

Benin half-bowed. "My Celestial Master requests the attendance of Lord Vorkosigan at this hour. Ah . . . we *will* return him to you."

"Your word upon it? It would be a major embarrassment for the embassy were he to be mislaid . . . again." Vorob'yev managed to be stern at Benin while simultaneously capturing Maz's hand upon his arm and covertly stroking it.

"My word upon it, Ambassador," Benin promised. At Vorob'yev's reluctant nod of permission, he led Miles out. Miles glanced back over his shoulder, lonely for Ivan, or Maz, or somebody on his side.

The ground-car wasn't half a block long, but it was a very fine vehicle indeed, and not military issue. Cetagandan soldiers saluted Benin punctil-

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iously, and settled him and his guest in the rear compartment. When they pulled away from the embassy, it felt something like riding in a house.

"May *I* ask what all this is about, ghem-General?" Miles inquired in turn.

Benin's expression was almost . . . crocodilian. "I am instructed that explanations must wait until you arrive at the Celestial Garden. It will take only a few minutes of your time, nothing more. I first thought that you would like it, but upon mature reflection, I think you will hate it. Either way, you deserve it."

"Take care your growing reputation for subtlety doesn't go to your head, ghem-General," Miles growled. Benin merely smiled.

It was definitely an Imperial audience chamber, if a small one, not a conference chamber like the room last night. There was only one seat, and Fletchir Giaja was in it already. The white robes he wore this morning were bulky and elaborate to the point of half-immobilizing him, and he had two ba servitors waiting to help him with them when he rose again. He had his icon-look plastered back on his face again, his expression so reserved it resembled porcelain. Three white bubbles floated silently beyond his left hand. Another ba servitor brought a small flat case to Benin, who stood upon the emperor's right.

"You may approach my Celestial Master, Lord Vorkosigan," Benin informed him.

Miles stepped forward, deciding not to kneel. He and the haut Fletchir Giaja were almost eye to eye as he stood.

Benin handed the case to the emperor, who opened it. "Do you know what this is, Lord Vorkosigan?" Giaja asked.

Miles eyed the medallion of the Order of Merit on its colored ribbon, glittering on a bed of velvet. "Yes, sir. It is a lead weight, suitable for sinking small enemies. Are you going to sew me into a silk sack with it, before you throw me overboard?"

Giaja glanced up at Benin, who responded with a *Didn't I tell you so?* shrug.

"Bend your neck, Lord Vorkosigan," Giaja instructed him firmly. "Unaccustomed as you may be to doing so."

Was not Rian in one of those bubbles? Miles stared briefly at his mirror-polished boots, as Giaja slipped the ribbon over his head. He stepped back half a pace, tried and failed to keep his hand from touching the cool metal. He would not salute. "I . . . refuse this honor, sir."

"No, you don't," Giaja said in an observant tone, watching him. "I am given to understand by my keenest observers that you have a passion for recognition. It is a—"

Weakness that can be exploited—

"—An understandable quality that puts me much in mind of our own ghem."

Well, it was better than being compared to the hauts' other semi-siblings, the ba. Who were not the palace eunuchs they seemed, but rather some sort of incredibly valuable in-house science projects—the

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late Ba Lura might be better than half-sibling to Giaja himself, for all Miles knew. Quite. Miles decided he would have more respect for, not to mention caution of, the silent slippered ba after this. They were all in on this haut-business together, the putative servitors and their putative masters. No wonder the emperor had taken Lura's murder so seriously.

"As far as recognition goes, sir, this is hardly something that I will be able to show around at home. More like, hide it in the bottom of the deepest drawer I own."

"Good," said Fletchir Giaja in a level tone. "As long as you lay all the matters associated with it alongside."

Ah. That was the heart of it. A bribe for his silence. "There is very little about the past two weeks that I shall take pleasure in remembering, sir."

"Remember what you will, as long as you do not recount it."

"Not publicly. But I have a duty to report."

"Your classified military reports do not trouble me."

"I . . ." he glanced aside at Rian's white bubble, hovering near, "agree."

Giaja's pale eyelids swept down in an accepting blink. Miles felt very strange. Was it a bribe to accept a prize for doing exactly what he'd been going to do, or not do, anyway?

Come to think of it . . . would his own Barrayarans think he had struck some sort of bargain? The real reason he'd been detained for that unwitnessed chit-chat with the emperor last night began to glimmer up at last in his sleep-deprived brain. *Surely they can't imagine Gaija could suborn me in twenty minutes of conversation. Could they?*

"You will accompany me," Giaja went on, "on my left hand. It's time to go." He rose, assisted by the ba, who gathered up his robes.

Miles eyed the hovering bubbles in silent desperation. His last chance. . . . "May I speak with you one more time, haut Rian?" he addressed them generally, uncertain which was the one he sought.

Giaja glanced over his shoulder, and opened his long-fingered hand in a permissive gesture, though he himself continued on at the decorous pace enforced by his costume. Two bubbles waited, one followed, and Benin stood guard just outside the open door. Not exactly a private moment. That was all right. There was very little Miles wanted to say out loud at this point anyway.

Miles glanced back and forth uncertainly at the pale glowing spheres. One blinked out, and there Rian sat, much as he had first seen her, stiff white robes cloaked by the inkfall of shining hair. She still took his breath away.

She floated closer, and raised one fine hand to touch his left cheek. It was the first time they had touched. But if she asked, *Does it hurt?*, he swore he'd bite her.

Rian was not a fool. "I have taken much from you," she spoke quietly, "and given nothing."

"It's the haut way, is it not?" Miles said bitterly.

"It is the only way I know."

The prisoner's dilemma. . . .

From her sleeve, she removed a

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dark and shining coil, rather like a bracelet. A tiny hank of silken hair, very long, wound around and around until it seemed to have no end. She thrust it at him. "Here. It was all I could think of."

That's because it is all you have that you truly own, milady. All else is a gift of your constellation, or the Star Crèche, or the haut, or your emperor. You live in the interstices of a communal world, rich beyond the dreams of avarice, owning . . . nothing. Not even your own chromosomes.

Miles took the coil from her. It was cool and smooth in his hand. "What does this signify? To you?"

"I . . . truly do not know," she confessed.

Honest to the end. Does the woman even know how to lie? "Then I shall keep it. Milady. For memory. Buried very deep."

"Yes. Please."

"How will you remember me?" He had absolutely nothing on him that he could give away right now, he realized, except for whatever lint the embassy laundry had left in the bottoms of his pockets. "Or will it please you to forget?"

Her blue eyes glinted like sun on a glacier. "There is no danger of that. You will see." She moved gently away from him. Her force screen took form around her slowly, and she faded like perfume. The two bubbles floated after the emperor to seek their places.

The dell was similar in design to the one where the haut had held the elegiac poetry recitations, only larger, a wide sloping bowl open to the artificial sky of the dome. Haut-lady bubbles and haut and ghem lords in white filled its sides. The thousand or so galactic delegates in all their muted garb crowded its circumference. In the center, ringed by a respectfully unpeopled band of grass and flowers, sat another round force dome, a dozen meters or more in diameter. Dimly through its misted surface Miles could see a jumble of objects piled high around a pallet, upon which lay the slight, white-clad figure of the haut Lisbet Degtiar. Miles squinted, trying to see if he could make out the polished maplewood box of the Barrayaran delegation's gift, but Dorca's sword was buried somewhere out of sight. It hardly mattered.

But he was going to have a ringside seat, a nearly Imperial view of it all. The final parade, down an alley cleared to the center of the bowl, was arranged in inverse order of clout; the eight planetary consorts and the Handmaiden in their nine white bubbles, seven—count 'em folks, seven—ghem-governors, then the emperor himself and his honor guard. Benin blended into ghem-General Naru's former place without a ripple. Miles limped along in Giaja's train, intensely self-conscious. He must present an astonishing sight, slight, short, sinister, his face looking like he'd lost a spaceport bar fight the night before. The Cetagandan Order of Merit made a fine show against his House blacks, quite impossible to miss.

Miles supposed Giaja was using him to send some kind of signal to his haut-governors, and not a terribly

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friendly one. Since Giaja clearly had no plans to let out the details of the past two weeks' events, Miles could only conclude it was one of those *catch it if you can* things, intended to unnerve by doubt as much as knowledge, a highly delicate species of terrorism.

Yeah. Let 'em wonder. Well, not *them*—he passed the Barrayaran delegation near the front of the galactic mob. Vorob'yev stared at him stunned. Maz looked surprised but pleased, pointing at Miles's throat and saying something to her fiancé. Vorreedi looked wildly suspicious. Ivan looked . . . blank. *Thank you for your vote of confidence, coz.*

Miles himself stared for a moment when he spotted Lord Yenaro in the back row of ghem lords. Yenaro was dressed in the purple and white garb of a Celestial Garden ghem-lord-in-waiting of the tenth rank, sixth degree, the lowest order. The lowest of the highest, Miles corrected himself. *Looks like he got that assistant perfumer's job after all.* And so the haut Fletchir Giaja brought another loose cannon under control. Smooth.

They all took their assigned places at the center of the bowl. A procession of young ghem-girls laid a final offering of flowers all around the central force bubble. A chorus sang. Miles found himself attempting to calculate the price in labor alone of the entire month's ceremonies if one set the time of everyone involved at some sort of minimum wage. The sum was . . . celestial. He became increasingly aware that he hadn't had breakfast, or nearly enough coffee. *I will not pass out. I will not scratch my nose, or my ass. I will not—*

A white bubble drifted up in front of the emperor. A short, familiar ba paced alongside it, carrying a compartmented tray. Rian's voice spoke from the bubble, ceremonial words; the ba laid the tray before Giaja's feet. Miles, at Giaja's left hand, stared down into the compartments and smiled sourly. The Great Key, the Great Seal, and all the rest of Lisbet's regalia, were returned to their source. The ba and the bubble retreated. Miles waited in mild boredom for Giaja to call forth his new empress from somewhere in the mob of hovering haut-bubbles.

The emperor motioned Rian and her ba to approach again. More formal phrases, so convoluted Miles took a full belated minute to unravel their meaning. The ba bowed and picked up the tray again on its mistress's behalf. Miles's boredom evaporated in a frisson of shock, muffled in intense bemusement. For once, he wished he were shorter, or had Ivan's talent for invisibility, or could magically teleport himself somewhere, anywhere, out of here. A stir of interest, even astonishment, ran through the haut and ghem audience. Members of the Degtiar constellation looked quite pleased. Members of other constellations . . . looked on politely.

The haut Rian Degtiar took possession of the Star Crèche again as a new Empress of Cetaganda, fourth Imperial Mother to be chosen by Fletchir Giaja, but now first in seniority by virtue of her genomic responsibility. Her first genetic duty would be to cook up

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her own Imperial prince son. God. Was she happy, inside that bubble?

Her new . . . not husband, mate, the emperor—might never touch her. Or they might become lovers. Giaja might wish to emphasize his possession of her, after all. Though to be fair, Rian must have known this was coming before the ceremony, and she hadn't looked like she objected. Miles swallowed, feeling ill, and horribly tired. Low blood sugar, no doubt.

Good luck to you, milady. Good luck . . . good-bye.

And Giaja's control extended itself, softly as fog.

The emperor raised his hand in signal, and the waiting Imperial engineers solemnly went into motion at their power station. Inside the great central force bubble, a dark orange glow began, turning red, then yellow, then blue-white. Objects inside tilted, fell, then roiled up again, their forms disintegrating into molecular plasma. The Imperial engineers and Imperial Security had doubtless had a tense and sweaty night, arranging the Empress Lisbet's pyre with the utmost care. If that bubble burst now, the heat-effects would resemble a small fusion bomb.

It really didn't take very long, perhaps ten minutes altogether. A circle opened in the gray-clouded dome overhead, revealing blue sky. The effect was extremely weird, like a view into another dimension. A much smaller hole opened in the top of the force-bubble. White fire shot skyward as the bubble vented itself. Miles assumed the airspace over the center of the capital had been cleared of all traffic, though the stream diffused into faint smoke quickly enough.

Then the dome closed again, the artificial clouds scurrying away on an artificial breeze, the light growing brighter and cheerier. The force bubble faded into nothingness, leaving only an empty circle of undamaged grass. Not even ash.

A waiting ba servitor brought the emperor a colorful robe. Giaja traded off his outer layer of whites, and donned the new garment. The emperor raised a finger, and his honor guards again surrounded him, and the Imperial parade reversed itself out of the bowl. When the last major figure cleared the rim, the mourners gave a collective sigh, and the silence and rigid pattern broke in a murmur of voices and rustle of departing motion.

A large open float-car was waiting at the top of the dell to take the emperor . . . away, to wherever Cetagandan emperors went when the party was over. Would Giaja have a good stiff drink and kick off his shoes? Probably not. The attendant ba arranged the Imperial robes, and sat by the controls.

Miles found himself left standing beside the car as it rose. Giaja glanced over at him, and favored him with a microscopic nod. "Good-bye, Lord Vorkosigan."

Miles bowed low. "Until we meet again."

"Not soon, I trust," Giaja murmured dryly, and floated off, trailed by a gaggle of force bubbles now turned all the colors of the rainbow. None paused as if to look back.

Ghem-General Benin, at Miles's el-

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bow, almost cracked an expression. Laughing? "Come, Lord Vorkosigan. I will escort you back to your delegation. Having given your ambassador my personal word to return you, I must personally—*redeem* it, as you Barrayarans say. A curious turn of phrase. Do you use it in the sense of a soul in a religion, or an object in a lottery?"

"Mm . . . more in a medical sense. As in the temporary donation of a vital organ." Hearts and promises, all redeemed here today.

"Ah."

They came upon Ambassador Vorob'yev and his party, looking around as galactic delegates boarded float cars for a ride to one last fantastical meal. The cars' white silk seats had all been replaced, in the last hour, by assorted colored silks, signifying the end of the official mourning. At no discernible signal, one came promptly to Benin. No waiting in line for them.

"If we left now," Miles noted to Ivan, "we could be in orbit in an hour."

"But—the ghem-ladies might be at the buffet," Ivan protested. "Women like food, y'know."

Miles was starving. "In that case, definitely leave straightaway," he said firmly.

Benin, perhaps mindful of his Celestial Master's last broad hint, supported this with a bland, "That sounds like a good choice, Lord Vorkosigan."

Vorob'yev pursed his lips; Ivan's shoulders slumped slightly.

Vorreedi nodded at Miles's throat, a glint of puzzled suspicion in his eyes. "What was *that* all about . . . Lieutenant?"

Miles fingered his silken collar with the Cetagandan Imperial Order of Merit attached. "My reward. And my punishment. It seems the haut Fletchir Giaja has a low taste for high irony."

Maz, who had obviously not yet been brought up to speed on the subtext of the situation, protested his lack of enthusiasm. "But it's an extraordinary honor, Lord Vorkosigan! There are Cetagandan ghem-officers who would gladly die for it!"

Vorob'yev explained coolly, "But rumors of it will hardly make him popular at home, love. Particularly circulating, as they must, without any real explanation attached. Even more particularly in light of the fact that Lord Vorkosigan's military assignment is in Barrayaran Imperial Security. From the Barrayaran point of view, it looks . . . well, it looks *very* strange."

Miles sighed. His headache was coming on again. "I know. Maybe I can get Illyan to classify it secret."

"About three thousand people just saw it!" Ivan said.

Miles stirred. "Well, that's your fault."

"Mine!"

"Yeah. If you'd brought me two or three coffee bulbs this morning, instead of only one, my brain might have been on-line, and I could've ducked faster and avoided this. Bloody slow reflexes. The implications are still dawning on me." For example: if he had *not* bowed his head to Giaja's silk collar in polite compliance, how dramatically would the

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chances have risen of his and Ivan's jumpship meeting some unfortunate accident while exiting the Cetagandan Empire?

Vorreedi's brows twitched. "Yes," he said. "What *did* you and the Cetagandans talk about last night, after Lord Vorpatril and I were excluded?"

"Nothing. They never asked me anything more." Miles grinned blackly. "That's the beauty of it, of course. Let's see *you* prove a negative, Colonel. Just try. I want to watch."

After a long pause, Vorreedi slowly nodded. "I see."

"Thank you for that, sir," breathed Miles.

Benin escorted them all to the south gate, and saw them out for the last time.

The planet of Eta Ceta was fading in the distance, though not fast enough to suit Miles. He switched off the monitor in his bunk aboard the ImpSec courier vessel, and lay back to nibble a bit more from his plain dry ration bar, and hope for sleep. He wore loose and wrinkled black fatigues, and no boots at all. He wriggled his toes in their unaccustomed freedom. If he played it right, he might be able to finesse his way through the entire two-week trip home barefoot. The Cetagandan Order of Merit, hung above his head, swayed slightly on its colored ribbon, gleaming in the soft light. He scowled meditatively at it.

A familiar double-knock sounded on his cabin door; for a moment he longed to feign sleep. Instead he sighed, and pushed himself up on his elbow. "Enter, Ivan."

Ivan had skinned out of his dress uniform and into fatigues as fast as possible also. And friction-slippers, hah. He had a sheaf of colored papers in his hand.

"Just thought I'd share these with you," Ivan said. "Vorreedi's clerk handed 'em to me just as we were leaving the embassy. Everything we're going to be missing tonight, and for the next week." He switched on Miles's disposal chute, in the wall. A yellow paper. "Lady Benello." He popped it in; it wooshed into oblivion. A green one. "Lady Arvin." Woosh. An enticing turquoise one; Miles could smell the perfume from his bunk. "The inestimable Veda." Woosh—

"I get the point, Ivan," Miles growled.

"And the food," Ivan sighed. "*Why* are you eating that disgusting rat bar? Even courier ship stores can do better than that!"

"I wanted something plain."

"Indigestion, eh? Your stomach acting up again? No blood leakage, I hope."

"Only in my brain. Look, why are you here?"

"I just wanted to share my virtuous divesting of my life of decadent Cetagandan luxury," Ivan said primly. "Sort of like shaving my head and becoming a monk. For the next two weeks, anyway." His eye fell on the Order of Merit, turning slowly on its ribbon. "Want me to put that down the disposer, too? Here, I'll get rid of it for you—" he made to grab it.

Miles came up out of his bunk in a posture of defense like a wolverine

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out of its burrow. "Will you get out of here!"

"Ha! I *thought* that little bauble meant more to you than you were letting on to Vorreedi and Vorob'yev," Ivan crowed.

Miles stuffed the medal down out of sight, and out of reach, under his bedding. "I frigging earned it. Speaking of blood." Ivan grinned, and stopped circling for a swoop on Miles's possessions, and settled down into the tiny cabin's station chair.

"I've thought about it, you know," Miles went on. "What it's going to be like, ten or fifteen years from now, if I ever get out of covert ops and into a real line command. I'll have had more practical experience than any other Barrayaran soldier of my generation, and it's all going to be totally invisible to my brother officers. Classified. They'll all think I spent the last decade riding in jump ships and eating candy. How am I going to maintain authority over a bunch of overgrown backcountry goons—like you? They'll eat me alive."

"Well," Ivan's eye glinted, "they'll try, to be sure. I hope I'm around to watch."

Secretly, Miles hoped so too, but he would rather have had his fingernails removed with pliers, in the old-fashioned ImpSec interrogation style of a couple of generations ago, than say so out loud.

Ivan heaved a large sigh. "But I'm still going to miss the ghem-ladies. And the food."

"There's ladies and food at home, Ivan."

"True." Ivan brightened slightly.

"S'funny." Miles lay back on his bunk, shoving his pillow behind his shoulders to prop himself half-up. "If Fletchir Giaja's late Celestial Father had sent the haut-women to conquer Barrayar, instead of the ghem-lords, I think Cetaganda would own the planet right now."

"The ghem-lords were nothing if not crude," Ivan allowed. "But we were cruder." He stared at the ceiling. "How many more generations, d'you think, before we can no longer consider the haut lords human?"

"I think the operative question is, how many generations till the haut lords no longer regard *us* as human." *Well, I'm used to that even at home. Sort of a preview of things to come.* "I think . . . Cetaganda will remain potentially dangerous to its neighbors as long as the haut are in transition to . . . wherever they're going. Empress Lisbet and her predecessors," *and her heiresses* "are running this two-track evolutionary race—the haut fully controlled, the ghem used as a source of genetic wild cards and pool of variations. Like a seed company keeping strains of wild plants even when they only sell a monoculture, to permit development in the face of the unexpected. The greatest danger to everybody else would be for the haut to lose control of the ghem. When the ghem are allowed to run the show—well, Barrayar knows what it's like when half a million practicing social Darwinists with guns are let loose on one's home planet."

Ivan grimaced. "Really. As your esteemed late grandfather used to tell us, in gory detail."

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"But if . . . the ghem fail to be consistently militarily successful in the next generation or so—our generation—if their little expansionary adventures continue to be embarrassing and costly, like the Vervain invasion debacle, maybe the haut will turn to other areas of development than the military, in their quest for superiority. Maybe even peaceful ones. Perhaps ones we can scarcely imagine."

"Good luck," snorted Ivan.

"Luck is something you make for yourself, if you want it." *And I want it more, oh yes.* Keeping one eye out for sudden moves from his cousin, Miles rehung his medallion.

"You going to wear that? I dare you."

"No. Not unless I have a need to be really obnoxious sometime."

"But you're going to keep it."

"Oh, yes."

Ivan stared off into space, or rather, at the cabin wall, and into space beyond by implication. "The wormhole nexus is a big place, and constantly getting bigger. Even the haut would have trouble filling it all, I think."

"I hope so. Monocultures are dull and vulnerable. Lisbet knew that."

Ivan chuckled. "Aren't you a little short to be thinking of redesigning the universe?"

"Ivan." Miles let his voice grow unexpectedly chill. "Why should the haut Fletchir Giaja decide he needed to be polite to me? Do you *really* think this is just for my father's sake?" He ticked the medallion and set it spinning, and locked eyes with his cousin. "It's not a trivial trinket. Think again about all the things this means. Bribery, sabotage, and real respect, all in one strange packet . . . we're not done with each other yet, Giaja and I."

Ivan dropped his gaze first. "You're a frigging crazy man, you know that?" After an uncomfortable minute of silence, he hoisted himself from Miles's station chair, and wandered away, muttering about finding some real food on this boat.

Miles settled back with slitted eyes, and watched the shining circle spin like planets. ■

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Sailing Bright Eternity, Gregory Benford, Bantam, $22.95, 404 pp. (ISBN: 0-553-08655-3).
Legacy, Greg Bear, TOR, $22.95, 326 pp. (ISBN: 0-312-85516-8).
Pasquale's Angel, Paul J. McAuley, Avon, $22, 374 pp. (ISBN: 0-688-14154-4).
Waking the Moon, Elizabeth Hand, HarperPrism, $19, 390 pp. (ISBN: 0-06-105214-0).
Ingathering: The Complete People Stories of Zenna Henderson, Zenna Henderson, NESFA Press, $24.95, 577 + xiv pp. (ISBN: 0-915368-58-7).
The Year's Best Science Fiction #12, Gardner Dozois, ed., St. Martin's, $26.95 hb, $16.95 pb, 624 pp. (ISBN: 0-312-13222-0).
Full Spectrum #5, Jennifer Hershey, Tom Dupree, and Janna Silverstein, eds., Bantam, $14.95, 478 + x pp. (ISBN: 0-553-37400-1).
The Hubble Wars by Eric J. Chaisson, Harper Collins Publishers, $27.50 (hard cover) $15.00, 387 pp. (paperback). (ISBN 0-06-017114-6 [hard cover]), (ISBN 0-06-092629-5 [paperback]).
BOOKS ON DISK

Let's have a big hand for **Sailing Bright Eternity**, the long-awaited conclusion to Gregory Benford's "Galactic" series. It has all the scope and wonder anyone could ask for, a galactic panorama, the glorious sweep of ages, and a vision of the evolution not just of races, not just of species, but of phyla. Here is the proof, if any is needed, that Benford has assumed the mantle of Olaf Stapledon. Since in the past he has laid ample claim to the mantles of Clarke and Heinlein, he must be a one-man Golden Age.

But enough hyperbole. The "Galactic" series began in 1977 with *In the Ocean of Night,* when Benford patched together a number of earlier stories. In 1984, he gave us *Across the Sea of Suns,* in which he introduced his idea of a universe-spanning conflict between organic and mechanical intelligences. *Great Sky River* appeared in 1987, *Tides of Light* in 1989, *Furious Gulf* in 1994.

His early hero was Nigel Walmsley, who hared off toward Galactic Center in a starship stolen from the mechs. Thirty-five thousand years later, he introduced us to the Family Bishop, heavily cyborged, out-sized folks who used materials and equipment salvaged from dead mechs to fortify and armor their bodies, and who plugged into their nervous systems chips that preserved the personalities, skills, and memories of their predecessors. They

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were also hounded by the Mantis, a mech of unusual intelligence and artistic ambitions, into a trap whose only exit put them on an ancient starship and sent them off toward the very same goal that Nigel Walmsley had sought long before.

That goal turned out to be a place, a refuge constructed of the fabric of space-time itself. It was supposedly immune to mech attack, but before *Furious Gulf* ended, the enemy was within the walls.

And now we have *Sailing Bright Eternity,* some of whose elements have appeared as shorter pieces. The Mantis is back, once more hunting Bishops. Nigel Walmsley is recollecting his career for the edification of young Toby Bishop and at the same time filling the faithful follower of the series in on a few of the highlights of 35,000 years of history. The mechs reveal that what they seek is the key to unfathomable pleasures buried deep in the DNA by eons-gone intelligences and obtainable in uncorrupted form only from the cells of three successive generations of Bishops—Toby, his father Killeen, and his grandfather Abraham; the mechs are aware that there is a rumor that the pleasures they seek may lead to their destruction. Toby seeks his father in a place where time runs like a river current. He sees wonders, not least among them that moment when the seeking mechs open up the invulnerable refuge the way a can opener opens up a tin can.

And in the end. . . . Higher goals. Vastly greater intelligences who, because they control causality itself, we might as well call gods. And an apotheosis that quite amply confirms the paucity of this reviewer's imagination. Perhaps you recall that I suggested Benford was heading toward some statement that the destiny of sentience lay in a symbiosis of flesh and machine, an evolution that combined elements of prior, differing forms, sentient life as a single encompassing entity to be optimized or perfected by using memories, personalities, talents, and tendencies of flesh and machine creatures. In the end, that is only one small part of his vision, which I will leave you to discover for yourself.

You will surely enjoy the process. Benford is an excellent writer, one of the best in this business, a visionary whose alternate identity as a physicist quite fails to nail him down to Earth. His mind soars far above those of most other SF writers.

Unfortunately, in that soaring he sometimes reaches heights where the air is a bit attenuated. Like Stapledon, he gets too abstract, too far removed from his story. He fails to carry his reader along with him, and our willing suspension of disbelief falters. Perhaps this is a function of his material—it is hard to maintain a concrete focus when dealing with might-as-well-be-gods—but to my mind, it still weakens the story.

Greg Bear does not make it easy to keep track of his work. In 1985, he published *Eon,* which described a marvel of technological wonder—the Thistledown, the asteroidal anchor for the Way, a tubular, habitable tunnel that wound, spaghetti-like, through all of infinite space-time, touching all

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worlds and allowing humans, or their alien foes, the Jarts, to open gates on those worlds. Three years later, his sequel, *Eternity,* told us a great deal more about the Jarts and suggested that the Way would have to be destroyed. Now, a decade after *Eon,* he gives us a prequel, **Legacy**, in which his hero Olmy must sally forth to Lamarckia, a world opened a few years previously by a group of disgruntled Thistledown residents, and see whether they have damaged their new home. Unfortunately, that portion of the Way that conceals the gate to Lamarckia is tangled and obscure. If he reaches his goal, he may never be able to return (though, since this is a prequel, we know he does).

Lamarckia is a strange place. Where Earth has ecosystems, it has "ecos," massive lifeforms that construct assorted specialized elements for special purposes. All are built to a unicellular plan, but there are only a handful of ecos on the entire planet. One of their distinctions is that they compete with each other by stealing each other's specialized elements, either whole or as small samples nipped from their flesh. When Olmy arrives—a generation after Lamarckia's settlement; time flexes when one passes through a Gate—he soon finds that an ecos is perfectly willing to sample human flesh as well, perhaps because its hidden "queen" or "seed-mistress"—whatever devises and produces new designs—wishes to borrow the human form for its own purposes. Perhaps fortunately, the basic human design—multicellular, specified by genes—is too alien for Lamarckia to interpret.

But these are hardly Olmy's thoughts. On his arrival, he stumbles upon a village that has just been massacred. Here is war, political conflict, its motivations obscure to him but clearly reflecting some deep schism among the Thistledown's schismatics. Soon he is among the locals, helping to defeat the raiders, enlisting on a ship which (like Darwin's *Beagle*) plans to circumnavigate the world and study its ecos, finding friends and even a potential lover. For a time he is removed from political conflict, immersed in the local environment, coming to an understanding of the problems the colonists have faced and conquered. And then they find a dead ecos, signs of attempts to mimic human beings, a living storm that destroys their ship. Among the few survivors, Olmy soon finds himself on a ship bearing the leader of the colonists to a meeting with the chief rebel. Revelations await, all very adequately foreshadowed, and disaster for a world.

If you wish to know more, read the book. It is an ingenious approach to biology and destiny with enough human passion and error and weakness to satisfy anyone. You'll love it, and I do expect to see it on award ballots.

The time of the Renaissance has drawn a fair amount of attention from SF and other writers. It was the time of Leonardo, Michelangelo, and Columbus, an age of invention and discovery and rampant creativity that led directly to the discovery of science, the industrial age, and today. And Italy's Florence was one of its hotbeds.

These are such thoughts as started

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Paul J. McAuley toward his latest novel, **Pasquale's Angel**. What if, he wondered, all those ingenious drawings of the Great Engineer (Leonardo) had been realized in devices of war and industry and commerce? Then Florence would surely have dominated Italy and Europe as it never did in our own past. What if an ascendant Florence instead of Spain had dominated contact with the Americas? Perhaps the newfound Savages would have been viewed more as equals and less as subhumans to be subjugated and exploited. (He does fail to mention the more biological aspects of contact between Europe and the Americas—the conquistadors were greatly aided by such things as measles.)

McAuley's sixteenth-century Florence is a place of steam-driven cars, bicycles, factories, smokes, stinks, and of course Renaissance Italian politics. The tale opens with apprentice artist Pasquale, who dreams of painting an angel such as no one has ever seen before, of the peyote used by a neighbor artist and his Savage woman, of a better shirt and a little more to eat. He witnesses the arrival of the great artist Raphael, vanguard for a Medici pope, and a brief contretemps. Soon he is assisting Niccolò Machiavelli, journalist, by drawing the scene for a local paper. And not long after that, he and Niccolò are investigating the murder of one of Raphael's colleagues, high in a semaphore tower, behind a locked door, and with a small model of a flying machine in his possession. Their investigation leads them to a reputed black magician and an attempt to burn what a modern reader recognizes as primitive photographs. There is talk that the Great Engineer's latest invention will make artists obsolete. There are signs of a plotting Inquisition, aimed at Spanish dominance. And finally, with Florence in flames, the artist flees in pursuit of vision.

The story moves well, propelled by quite Machiavellian intrigues. Any reader who knows a bit of history may feel exceedingly estranged from reality—McAuley's Florence is a far cry from the way it really was—yet McAuley is playing a serious game. Other writers have suggested that Leonardo was a frustrated time-traveler. McAuley lets him succeed in bringing his extraordinary visions to life and paints what must surely be reckoned as a fair portrait of what that must have done to the world in which Leonardo lived. We would indeed have achieved the industrial age much sooner—and by the present day, we might be among the stars, perhaps dancing as angels. Or perhaps we would already be extinct—McAuley does not duck the obvious association of technology with war.

Elizabeth Hand is an astonishing writer. In her SF mode, she has given us *Winterlong, Aestival Tide,* and *Icarus Descending,* a trio of striking and intricate novels of a distant future when reality has a powerful air of fantasy. Her writing then was often lush and intense and colored by a dark, dark vision.

With her newest novel, **Waking the Moon**, she turns to fantasy, but no *Analog* reader who has enjoyed her SF

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should ignore this one for that reason. *Waking the Moon* is already being called her first masterpiece, and justly so. Here her lush intensity becomes the gift of utter persuasion. And besides, it is quite fascinating to see her return to Washington, DC, the City of Trees she spent so much effort on in *Winterlong*, though here the main locale is the University of the Archangels and St. John the Divine, and to see how her concern with women's myth and knowledge, embodied in the robot Nefertity in *Icarus Descending*, can take a very, very different form.

The tale begins with the arrival of Sweeney Cassidy at the Divine. She is a raw freshman, awed by the multi-ecclesiastical architecture of the Divine, the angels that flank her dorm room's window, quite astonishingly smitten when she meets Oliver in Professor Balthazar Warnick's course on Magic, Witchcraft, and Religion, just as astonishingly overawed by Angelica di Rienzi, elegant and polished and seeming to know everything worth knowing. Sweeney lets Oliver sweep her away on a furious round of drunken exploration of the city and avoidance of classes. She sleeps with Angelica and is insanely jealous when Angelica sleeps with Oliver. And one night she dreams of enormous angels standing in her room, studying her; in the morning, she finds an enormous feather on the floor.

Meanwhile, Balthazar Warnick is summoned from a rural retreat—a magic door cuts the hours-long drive to a mere moment—to witness a mystic sign, a sprig of green growing from an icon many millennia in age. It is, he agrees, a Sign, perhaps even the Sign his group has been awaiting for thousands of years.

That group is the Benandanti, made up of scholars, merchants, rulers, priests of every imaginable religion. Their name means something like "the good walkers," or "those who do well." Since before the time of Christ or Moses, they have guarded male-dominated, patristic civilization against any resurgence of the goddess-worship that once dominated the world. The Sign may indicate such a resurgence.

But in what form? Magda Kurtz, once one of the Benandanti, now an anthropologist who has written about the ancient goddess cult and wears a lunula, an ancient necklace steeped in Moon-Goddess power, uses a Hand of Glory to empower a scrying-bowl and see the faces of the boy and girl signified by the Sign. She does not know their names, but soon, soon, she will meet Angelica, recognize her, and give her the lunula. Then, lacking the lunula's protection, she will be killed by the Benandanti, ushered through one of those magical doors into a place of horror, and Sweeney will see it happen.

It is not long before we see Angelica apparently becoming something like a priestess of the goddess. She dances with a bull, and then she slays it, cutting its throat with the lunula. Almost, she performs a human sacrifice, and then, in the hullabaloo that erupts around her, she vanishes. Soon afterwards, Oliver promises Sweeney, "Next time, I'll love you," and commits suicide.

Sweeney is expelled, but the Benan-

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danti see to it that she soon settles into another school, and then into a job at a Washington museum. Years pass without incident. And then Angelica reemerges as the leader of a womanist cult. We learn that human sacrifice is now routine for her, and her thousands—perhaps millions—of followers, urged to embrace the dark side of the Goddess, seem just as ready to drink at that altar. Furthermore, she has an agenda: In just four months, she will perform the final rites that will bring the ancient Moon-Goddess back to life. The world will once more be one whose women dance beneath the Moon and offer up their husbands and sons to the ravenous Goddess of the night.

Is there any hope? Guess who Sweeney's new intern at the museum turns out to be—Angelica's son Dylan, the spitting image of dead Oliver, and as if in remembrance of Oliver's pledge, he indeed falls in love with Sweeney, twenty years his elder. Here perhaps is the handle the Benandanti need to fulfill their ancient mission, to save the patristic world.

Should they succeed? That's a fair question, since the idea that women once ruled the world—supported by much more agenda-driven speculation than solid evidence—is popular today among feminists and New Agers. What Elizabeth Hand does in *Waking the Moon* is consider the true nature of the ancient goddess cults. They were, she says, by no means all hearts and flowers, sweetness and light. As any reader of Frazer's *Golden Bough* soon gathers, they were bloody, cruel, as monstrous as any male-led cult of Moloch. Perhaps, she says, the putative shift to a male-dominated society was, on balance, not a bad thing at all.

On the other hand, remember Moloch. Or Bosnia-Herzegovina. Or Israel. Or. . . . Religious cruelty really seems to have much less to do with gender than it does with the basic human yen for a legitimating excuse to persecute one's neighbors.

Great book. You'll love it. Don't miss it.

In her introduction, Priscilla Olson says, "I discovered Zenna Henderson [as an adolescent]. Adolescence isn't easy, but the People helped some of us make it through . . ." The stories in **Ingathering: The Complete People Stories of Zenna Henderson** are sentimental—some, says Olson, call them mawkish—but they are about being different, an outsider, and trying desperately to fit in. The People were refugees from a shattered world, absolutely human in form but blessed with a variety of mental powers. Their ships came to Earth a century ago, and colonies appeared in hidden corners of the American Southwest, precisely where Henderson lived and taught elementary school. The People adapted, and when the outside world discovered them—often in the guise of a young school teacher—things could get quite interesting. Henderson was a very evocative writer, and I remember these tales as fondly as does Olson. It may not be too much to say that they are as important to the history of SF as the work of anyone less than, say, Heinlein and Asimov. I think particularly of Clifford Simak, with whose

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works Henderson's share a certain quite charming flavor and ability to influence others. Indeed, I would not be surprised to learn that the memory of the People helped give rise to the Alien Nation TV show and book series.

There have been two earlier collections of People stories, *Pilgrimage: The Book of the People* and *The People: No Different Flesh*. The title of the second nicely expresses much of Henderson's concern with difference and discrimination, and it is worth noting that when these stories were being written, from the early 1950s through the mid-1970s, these were also major concerns for American society. Henderson showed the problems being surmounted in seventeen "stories of us at our best, as we hope to be, and where (with work and with luck) we may be in some future. . . ." (Olson).

The book includes all the stories of the earlier collections, three that appeared in other books, one that has so far had only a magazine appearance, and one, apparently written in 1956, that has never before seen print. There is also a brief reminiscence Henderson wrote in 1980, three years before her death.

This one belongs in your library. It would also make a grand gift for an adolescent reader. Fortunately, you will be able to obtain it for years to come. It is part of the NESFA's Choice series, dedicated to bringing "back into print classic science fiction that is essential to any good collection, but which is becoming increasingly difficult to find as the publishing industry's backlist shrinks." The books of the series are printed on acid-free paper and solidly bound, and NESFA says it plans to keep them permanently in print.

I haven't read them—my reading has been curtailed this month by a bout with pneumonia—but do let me call your attention to two major anthologies. The first is the twelfth edition of Gardner Dozois's **The Year's Best Science Fiction**. As usual, it brings you an incisive summary of the year (1994 this time) and a host of the best stories of the year, with "best" nicely attested by the one *Analog* story here—Michael Flynn's "Melodies of the Heart." There are also stories by Ursula K. Le Guin, Robert Reed, Maureen F. McHugh, Nancy Kress, Terry Bisson, Pat Cadigan, George Turner, Joe Haldeman, Mike Resnick, Michael Bishop, Howard Waldrop, and more.

Many of the names in **Full Spectrum #5**, edited by Jennifer Hershey, Tom Dupree, and Janna Silverstein, are less familiar. Does this mean the book is of less stellar quality? Well, no—Gene Wolfe is here, as are Michael Bishop, Karen Joy Fowler, Patricia A. McKillip, Neal Stephenson, Lisa Mason, Bill Barton, and Doug Beason, among other familiar names—but *Full Spectrum* is an original anthology, more like a giant (and very good) magazine issue, and the contents have only been selected once. Next year's Dozois volume may have just one or two from this book.

Which one or two? Why not buy a copy and see if you can spot them?

(Review by Peter Manly)

The Hubble Space Telescope is a

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multibillion dollar effort with all of the problems of any government project. Dr. Eric Chaisson gives an insider's view of the triumphs and tragedies with personal anecdotes and a description of how it felt to be part of the team. He opens the book with a heart-pounding first-person description of the launch of Space Shuttle *Discovery* carrying the telescope he'd staked his career on.

We all know from the headlines that the Hubble launch was delayed for years because of the *Challenger* tragedy. The author lets us know what it was like for scientists during that period. The waiting was agony. His peers were out observing every night with ground-based telescopes. Chaisson pressed on as the director of educational programs for the Space Telescope Science Institute (STSI), an agency separate from NASA. In that position he was responsible for communicating the scientific reality of the Universe to the taxpayers who had paid for the information. His public information counterparts at NASA and the companies who built Hubble had different agendas, often motivated by perceptions of national policy, politics or corporate return on net assets.

This is the story of a Good Soldier who (mostly) didn't complain in public about gaffes of his contemporaries. The issues are highly technical and often complicated. Chaisson spends a good part of the book explaining clearly and concisely the science of basic astronomy. Some of these passages get to fairly elementary grade-school levels but you can skip those parts and get on to the meat of the book. He then relates these concepts to the practical engineering and management of the Hubble Space Telescope.

STSI often disagreed with NASA management. Chaisson names names and points fingers at petty bureaucrats, self-centered engineers, elitist scientists and obstinate or clueless congresscritters. He even reveals a major technical goof-up that he alone orchestrated. More importantly, he identifies the Good Guys such as STSI director Riccardo Giacconi and then goes on to relate the director's penchant for gobbling pizza at train stations. He fleshes out the characters with small details such as midnight phone calls, attending the Baltimore Orioles baseball games and the mundane workings of family life for a scientist. Often he simply refers to That Senator or The Hot Optical Engineer but those in the industry know who these characters are.

The author alternately takes the reader to the edge of the known Universe with spectacular photos and then yanks the reader back to tedious committee meetings in which they argue for hours (including incredible histrionics on the part of respected scientists) just to get a second photo. The large index allows the careful reader to cross-reference most anything and Chaisson apparently understands that a good index is a word-association game played between the author and the reader. Lavishly illustrated with both raw and processed images, the book includes a color center section with photos that bring alive the romance of astronomy.

The optical flaw in Hubble's mirror

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is meticulously explained with about as much optical theory and engineering detail as would usually grant a master's thesis. There are other flaws in Hubble, less publicized but just as dangerous, such as the vibrations caused by thermal flexing of the Solar power array. The book describes the Herculean effort of software programmers to accommodate these discrepancies to make them transparent to the scientists whose only concern is gathering specific photons.

With Hubble's optical flaws, a desperate scramble was made to collect any scientific data possible before public opinion and Congress might shut the program down. STSI put together a last-minute observing program of just the right objects to pique the citizens' interest. You might think they were just playing to the Cheap Seats—they actually committed Felony Science In the First Degree. The book reads like the best techno-thriller novel—except that all the characters and events are real! Image processing algorithms were invented out of necessity which have since been applied to everything from geology to life sciences.

The shuttle mission to repair Hubble's optics and replace the Solar array seems almost anticlimactic—a sugary "happily ever after" ending to a dramatic episode. The spacecraft cranks out almost half the data bits per day that are generated by the astronomical community world-wide. The public has since turned its attention toward more mundane and Earthly events of skirmishes, scandals and sports. Occasionally, if I remember to look for it, I can see the spacecraft cross my sky to the South, looking like a moving pinpoint of light. It is really a point of enlightenment.

The Hubble Space Telescope continues to knock my socks off about once a week. Last week's brainbender was the confirmation that the theoretical Kuiper Band of trillions of comets is really out there (and we can thus refuel interstellar spaceships along the way). We tend to think of astronauts as being heroic. But there are plenty of folks who have the Right Stuff who remain on the ground. Eric Chaisson will introduce you to many of those players and he will also give you a small peek into the soul of a scientist.

BOOKS ON DISK

Issue 19 of *The Electronic Publishing Forum* ($6; $12 for four issues from Serendipity Systems, P. O. Box 140, San Simeon, CA 93452) has several items of potential interest to you. The best may be a listing of titles made available electronically by Project Gutenberg, any of which you can buy on CD-ROM or download directly, for free; the list includes items by Verne, Wells, Burroughs, and Doyle, as well as Abbott's *Flatland*. In addition, there is the *Government Writer's Guide*, a usage handbook of some value to all writers, a brief description and demo of NeoPaint, a shareware image manipulation program, and several items on setting up documents and "multi-participant interactive simulations" for the Internet. ■

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To: *Analog:*

I just finished reading *Hobson's Choice* (Mid-December 1994-March 1995). I take back most of the nasty things I thought and said about *Analog* running back-to-back four part serials. This was worth waiting for.

The ideas expressed by Robert J. Sawyer will fuel many a lively debate in cyberspace. I need time to digest them all and make the new neural connections of understanding

LORRITA MORGAN

CIS: 74444,2301
Prodigy: SPJW82A

Dear Dr. Schmidt,

After reading Tom Ligon's "The Pattern," (March 1995) I have just one question: why is this science *fiction?* I own a very small business, so I know Dan's computer must really exist! Whenever my customers want any reasonable merchandise, I find it is no longer available, or if it is, I'm expected to order in lots measured in the hundreds—or thousands. The town I live in has a population of 1,500. It is unlikely I'll be able to unload 1,000 purple plastic widgets with pink polka dots on the 10 customers who each want one solid blue metal widget. (Believe me, the manufacturers also use Dan's services.)

I could get on my soapbox about the problems Dan's computer creates throughout the entire economic chain of the country, but you have the story listed as fiction. . . .

Perhaps G. Harry Stine's column pertaining to space exploration and Tom Ligon's (fiction?) article are related. I suspect "corporate headquarters" wouldn't fund new methods of space exploration even if it could be shown they would be advantageous and economically feasible if done in a sensible manner. After all, Dan's recommends against such ventures because NASA isn't making money. The "little stores" that might have done the job "have all been forced under." As Mr. Ligon says, "Dan's isn't any good, just really cheap."

I look forward to receiving *Analog* each month. Thanks for hours of enjoyment and thought-provoking articles.

P.S. I followed up on Mr. Ligon's research. I found Dan's is a subsidiary of Nick's Enterprises, which is being bought out by BZLBUB, Ltd. BZLBUB is, of course, a major contributor to Sen. Phoghorn's wife's favorite charity. Sen. Phoghorn, in case you've forgotten, is the chairman of the Commerce Committee.

LUCINDA MIGALSKI

816 South First
Stockton, KS 67669

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Sir:

I was disappointed that you saw fit to preserve the tone of the letter from G.R. Patterson III regarding inaccuracies in "An M-1 at Fort Donelson" (March 1995). The errors committed did not merit this kind of invective, the epistolatory equivalent of invoking the death penalty for littering. It must be possible to publish feedback without vitriol. Writers and artists have a hard enough time researching topics for which they know there is always going to be a reader who knows far more than they do without fearing gratuitous public humiliation.

PETER SCOTT

Burbank, CA

I think your comparison is a good one, and I agree that feedback—even serious criticism—can be given without undue vitriol. But tampering with the tone of a letter is dangerous business; it can easily lead to a gross misrepresentation of the writer's actual position. I find that even more objectionable than the occasional intemperate letter—but I do appreciate when letter writers try to maintain a rational enough tone so that the amount of light generated is at least equal to the heat.

Dear Stanley Schmidt:

This is about the Moon colony and Alan Lister series by Grey Rollins. Just finished "Evolution,"(December 1994). I am several months behind reading the magazines.

I have thoroughly enjoyed them. It is like reading *Atlas Shrugged* all over again. The quotation "from each according to their ability and to each according to their need" comes of course from the New Testament Acts 2: 44-45 or 4: 32-35.

However, when Ayn Rand wrote her books in the 1930s, the carrying capacity limitations were not quite as clear as they are now. I am interested in the author's opinions on this.

Yes, in many ways it is very tempting to believe in Ayn Rand's principles. It is my understanding that libertarians follow her philosophy. Lyndon LaRouche believes that the planet urgently needs 20 billion people (*New Federalist*, September 19, 1994). They also believe that most environmentalist groups are in cahoots with Henry Kissinger and Prince Philip of England, and others have a conspiracy to commit genocide of the human species.

The Good Doctor Asimov calculated in 1988 (*Fantasy and Science Fiction*, June 1988) that if the doubling rate would stay constant, in 2554 the planet's population would be 20,000 billion. That would cover the oceans, the arctics and mountaintops—the same density as Manhattan at high noon.

He then assumed that every star in the Universe had ten habitable planets and that we could transfer people from planet to planet instantaneously (Holmes Door). Every planet would be filled to Manhattan density by 6170. If all the mass in the Universe could be converted to human flesh, this would be done by the year 8700.

I have been trying to read between the lines of the author and the author keeps talking about the necessity of breeding stock for the Moon and

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Mars. From this I assume the author believes there are no limitations.

If the author believes there are limitations and we could guess what Ayn Rand would say about exceeding the "carrying capacity," there are several scenarios. Ms. Rand believed no person should be forced to support another. If any given habitat exceeds the carrying capacity, what is the best solution—war, starvation, disease, infanticide. In many areas of the globe, the medical infrastructure to provide for contraception or abortion is not in place, due either to economic or religious reasons. Yes, I agree with the author, various religious beliefs have much to do for exceeding the "carrying capacity." In developed countries where the medical infrastructure is in place, contraceptives are not available in many cases due to religious reasons. Another reason is that most businesses want to grow as fast as possible for the next 3 months, never mind whether there is enough left to support the human race 50 years from now.

Maybe the author believes the Universe is limitless, maybe not. In any case I am interested in his views on "carrying capacity."

KERTTU S. LUND
5559 North Lyndale
Minneapolis, MN 55430-3216

The author replies. . . .

Kerttu Lund raises an excellent point in his letter. I may have inadvertently given the impression that I believe that the human race can expand its population without regard for the consequences.

A fair percentage of the stories I have written share the same background, in that I use Luna (the Moon, obviously) and, with one exception, have set the individual stories in one of three cities: Besselton, New London, or Crisium. As far as I am concerned, those are the only population centers of any consequence. The aggregate population of Luna, including sundry scientific installations and a few tiny outlying communities, is less than 200,000 people.

While this, genetically speaking, should provide a stable breeding population, face it, it's not even the equivalent of a decent-sized city here on Earth. Since, as portrayed in my stories, Earth and Luna have a sometimes tense relationship, Alan Lister would be foolish not to consider the consequences of completely severing ties with Earth. If Earth and Luna were to go their separate ways, it would be nice to have as much genetic diversity on hand as possible.

Also, consider the consequences of a catastrophic municipal structural failure, due to quakes (see my story "Once In A Blue Moon"), meteorites, terrorism (a subplot in the earlier part of the Darwin's Children sequence), or human error. It would not be inconceivable to lose a third of the Lunar population more or less instantaneously.

I don't pretend to know what the "carrying capacity" of Luna might be, especially if we were to honeycomb the interior with tunnels. Considerable, I would imagine. However, we wouldn't need to go to such extremes to start a few more cities and spread

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out a bit. Perhaps a population on the order of millions to one billion would be appropriate without being overwhelming. Considering the interior volume of Luna, I think that would still give everyone sufficient room to live.

On the other hand, how many people do you want? Speaking purely for myself, I prefer solitude, and lots of it. Others obviously disagree. I am not at all comfortable with the idea of having 20 billion people on Earth . . . hell, I'm not comfortable with 5 1/2 billion!

One of the things I was trying to say in the Darwin's Children stories is that people should be responsible for their own actions—both short and long term. That implies that, amongst other things, we should keep an eye on our reproductive rate. What with people who do not feel bound by the consequences of their actions, religions that seem to agree with Lyndon LaRouche, and the fact that some people just aren't happy unless they're elbow to elbow with their fellow man, those of us who prefer more breathing space may be outvoted.

I don't recall anything in Rand's writing that said anything about being prolific. Certainly, her characters were anything but; I don't recall a single child in any of her work, and all her characters seemed to be only children. From this, I conclude that she would not have endorsed the idea of having huge families. If Libertarians claim to follow her philosophy, they must have a rather strange interpretation of it.

As for "from each according to their ability and to each according to their needs," I have identified no fewer than five equivalent quotations, although the Bible is historically the oldest of them. The reason I chose Marx's phrasing (each quote is worded somewhat differently) was that I specifically wanted to reference Communism, which was appropriate in the context of the story.

As it happens, I considered writing that scene to have a religious theme rather than economic, but decided to stick with logic. Religion is based on emotion, not logic, and any writing pertaining to it will, sooner or later, come back to feelings. Belief is a subjective, not objective frame of mind. I may yet try to write a story along those lines.

In the meantime, please accept my assurances that I find personal accountability to be in direct conflict with the concept of any planet or moon that even approaches its carrying capacity.

GREY ROLLINS

Dear Dr. Schmidt:

Can't say I was much impressed with the March '95 issue, not even Poul Anderson's work. This was filler stuff, light end entertainment, but not very memorable. (Although several *Quantum Leap* fans got a hoot out of Dr. Forward's article.)

"The Political Jupiter Effect" is one of those areas where us SF readers *can* do something, and *should* be! With a whole bunch of new Congresscritters infesting D.C., we have the opportunity to put a few things before their eyes that they've never thought about before. Readers: Go get

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a pack of plain postcards, and fire one off every week! We want SETI back! We *need* that "cosmic catalogue" (*please,* somebody, come up with a better shorthand for it). We *have* to have more support for research (and less for that golden cow, the military). And NASA would be better off if its entire top echelon (every manager GS-15 and above) were sliced off. (Stine at least got that much right.)

If *Analog* readers would get half as politically active as, say, the NRA, we may yet see Mars before the turn of the century. All it costs is a postcard, and the worst they can say is "no!"

DIAN L. HARDISON

Cocoa, FL

Editors:

I've been wanting to write for quite some time to tell you just how much I appreciate the magazine you publish.

I've been a long-time reader—pushing 30 years now—starting with my father's subscription back in the '60s. At that time, I didn't realize how unique *Analog* was.

Over the years, I've tried other sci-fi magazines—including *Asimov's*—and have found them to have an entirely different editorial focus and philosophy. I got sick of reading stories about incest (I'm not kidding—story after story in different magazines—sheesh!), sexual oddities and various perversions, unreal fantasies, and a multitude of stories that left me wondering just what the hell the person was trying to say—if anything!

I suppose those types of stories have their markets, but that's not what I read a sci-fi magazine for! Somehow, over the years, with different editors and publishers, *Analog* has maintained a wholly different approach—one that I've never tired of.

I don't know how you define that editorial focus and approach, but as long as you keep it up, you'll have me for an enthusiastic subscriber. My thanks for your efforts, and nearly 30 years of reading pleasure.

GLEN GILCHRIST

Milwaukee, WI ■

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ARISIA '96 (Boston area speculative media conference) at Park Plaza Hotel & Towers, Boston, Mass. Guests of Honor—Emma Bull & Will Shetterly, Artist Guest of Honor—Lissanne Lake, Fan Guest of Honor—Rob Bazemore. Registration—$30 in advance, $40 at the door. Info: Arisia, Inc., 1 Kendall Square #322, Cambridge MA 02139. arisia-info@asylum.sf.ca.us

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CHATACON 21 (Tennessee SF conference) at Radisson Read House, Chattanooga, TN. Guests—Walter Jon Williams, Charles de Lint, Keith Parkinson, Steven Brust, Charles L. Grant, Mark Poole. Registration—$22 until 30 November, $30 until 1 January, $35 thereafter. Info: 23908, Chattanooga, TN 37422. (404) 587-6461. 71672.1416@compuserve.com OR mdillson@oass.enet.dec.com

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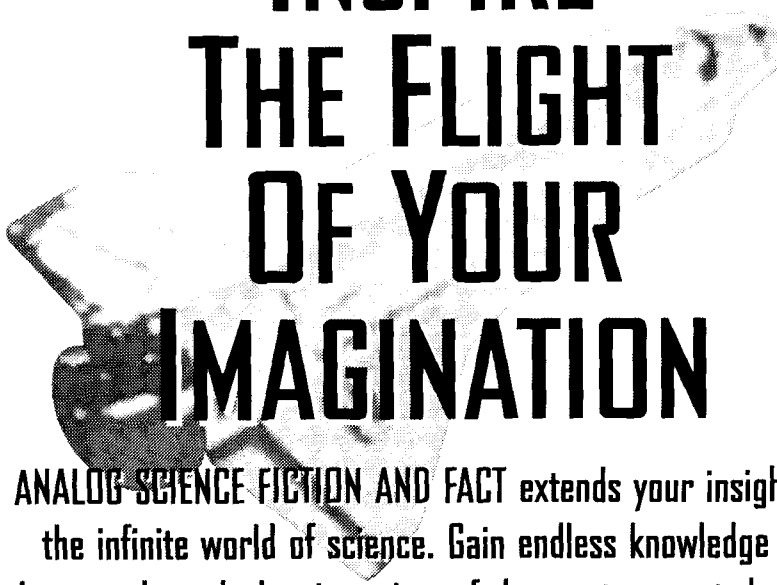

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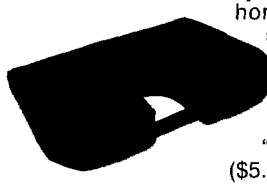

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